INDIAN FOOD INDUSTRY

VOLUME 17
3/1998
MAY/JUNE

A PUBLICATION OF ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA)

VIEWS : FOOD SECURITY AND FUTURE

TRANSFORMATION OF WORK CULTURE

ISO Standards for Indian Food Industry

HACCP Concepts vis-a-vis Animal Food Industry

Microorganisms in Fermented Foods

N-nitrosamines in Dairy Products

ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA), MYSORE - 570 013

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- Affiliated to the Institute of Food Technologists, Chicago, Illinois, U.S.A.
- The Association is a professional and educational organization of Food Scientists and Technologists, with its headquarters at Mysore.
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- Promotion of research, development and training in the Science, Technology and Engineering of Food.
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- Holding symposia/conventions on different aspects of Food Science, Technology and Engineering.
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Indian Food Industry (ISSN-0253-5025) is a bi-monthly publication of the **Association of Food Scientists and Technologists (India),** devoted to give extensive coverage to technological and market development relevants to food industries in India.

Review articles, technology papers based on R&D work and reports on various aspects concerning food industry are welcome from food scientists and technologists from industry, research institutions and other related organisations. Contributors are advised to provide good quality illustrations in the form of charts and photographs along with the manuscripts. The Editorial Board reserves the right to edit the manuscripts in order to make them suitable for publication in the journal, while assuming no responsibility for the statements and opinions expressed by the contributors, nor will they bind AFST (1) in any way. Readers are free to air their views through letters which may be published in the journal from time to time.

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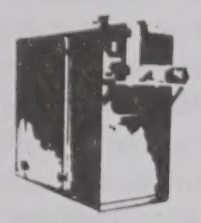
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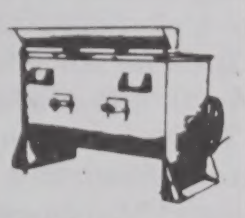
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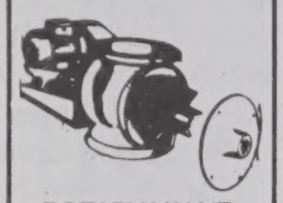
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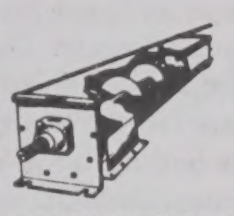
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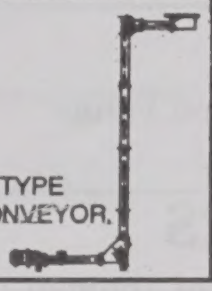
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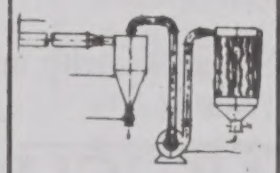
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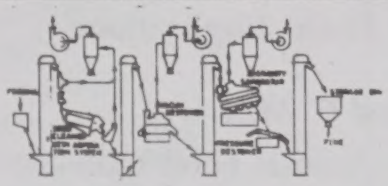
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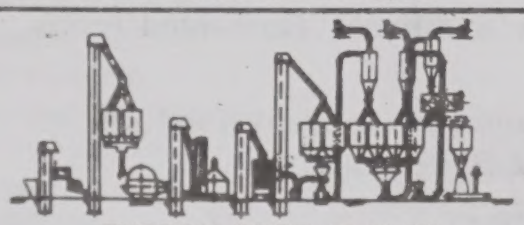
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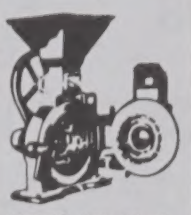
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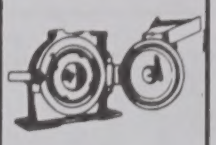
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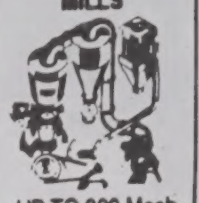
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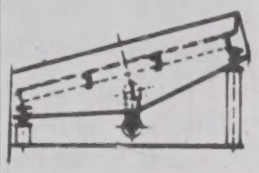
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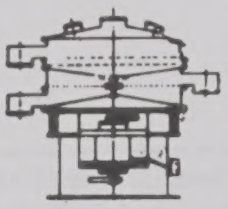
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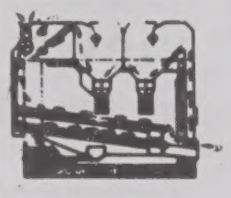
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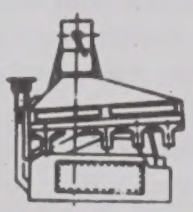
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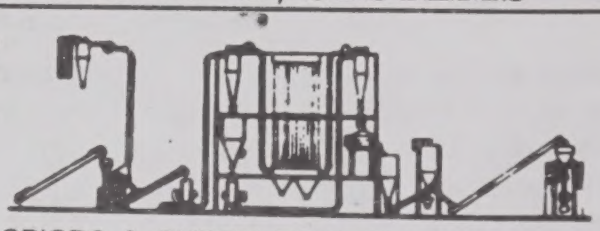
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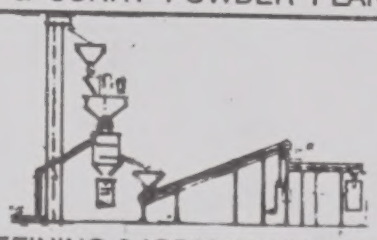
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FROM
THE CHIEF EDITOR'S DESK

Indeed, Indian Food Industry is seized of the question of quality more so now than at any other time. The industry has to understand the practical approaches to the question. Quality parameters are multifaceted. Broadly, it is (i) the absence of harmful components as contaminants (microbes, microbial toxins, heavy metals, pesticides) or as those inherent to food (antinutrients, allergens, toxins) and (ii) conformity to declared values of content of nutrients. Yet, another criterion is the value addition that imparts attributes to appeal to aesthetic sense in terms of appearance, flavour and texture of the food product. Of foremost importance is the first mentioned criterion viz., the absence of harmful components in food.

Many well established large scale food industries could be managing this problem quite successfully owing to their knowledge and established infrastructure, which are being reinforced constantly by the enforcement system from outside. We are not so sure about the conditions in cottage and small scale food industries. Many of them are manufacturers of traditional food products and some of them are yet to be fully aware of the basic problems of food quality. A limited survey conducted by a Premier Food Research Institute revealed the presence of aflatoxin (a very dangerous fungal toxin) above permissible limit in several market samples of peanut brittle (groundnut chikki). An approach to tackle this problem would be the extensive education and training of the management and personnel of food industries. It would be a good augury for the country, if a concerted effort by the Central and State Governments, national laboratories, universities and most importantly, the Industry itself is brought in, in this effort to produce quality food products. It is heartening to see that efforts are afoot from different angles. On just one aspect of food hygience, the Bureau of Indian Standards has provided guidelines on the application of HACCP in a small useful document entitled "Food Hygiene - Hazard Analysis and Critical Control Point (HACCP) - system and Guidelines for its Application (ICS 67.020; ISS-15000:1998). The document can be obtained from : BIS, Manak Bhawan, 9, Bahadur Shah Zafar Marg, New Delhi - 110 002. *(See. p. 133).*

We had mentioned earlier that 'Quality Sells', since the selling is the life blood, food industries need not wait for others, not even the enforcement machinery. Rather, they can bring in self imposed enforcement in manufacturing quality food products for their own health and growth.

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INDUSTRY NEWS

BIS Grants HACCP Certificate to Mother Dairy

Marking a major step towards the Indian Food Industry achieving global standards, Mother Dairy, New Delhi has received the prestigious Hazard Analysis Critical Control Point (HACCP) - certificate from the Bureau of Indian Standards for production and supply of milk, ice-cream and ice-candies. The certificate has been granted in accordance with "IS 15000-1998- Food hygiene, Hazard Analysis and Critical Control Point (HACCP)- system and guidelines for its application." This Indian Standard is based on the Codex Standard ALINORM 1997/13A.

The HACCP System ensures food hygiene, safety, better use of resources and timely response to food safety problems. At the international level, it is recognised as the most effective means of minimizing the occurrence of identifiable food borne biological, chemical and physical hazards. Major food importing countries like the European Union, USA, Canada, Australia are now insisting on HACCP Certified products.

The BIS HACCP Certification Scheme provides a dual advantage to the industry of having ISO 9000 Quality Management System along with HACCP through the same quality audits. Bureau of Indian Standards had recently launched the HACCP Certification Scheme so that the Indian Food Industry could meet the quality requirement of the world food markets.

BIS Launches Certification Scheme for Food Industry

Keeping step with the international emphasis on quality certification, BIS has launched a prestigious certification scheme specially for the Indian food industry, which will considerably enhance the marketability of Indian food products heading for export markets. The Hazard Analysis Critical Control Point (HACCP) certification scheme based on "IS 15000:1998 HACCP- system and guidelines for its application", meets all international requirements as laid down in the Codex Alimentarius Commissions Standard ALINORM 97/13A.

Major food importing countries like Australia, New Zealand, Canada, USA and EU are according mandatory status and fixing deadlines for certification under HACCP Scheme, for products like meat, poultry, marine, fruits and vegetables, processed foods etc.

The HACCP scheme acts as a complement to the ISO 9000 quality system standards. Certification under these two schemes can be taken simultaneously through the same quality audits. Units taking certification in HACCP scheme can derive important benefits like reduction of contamination, product destruction, preferred supplier status etc.

Food Processing Ministry Plans to Set Codex Monitoring Cell

The ministry of food processing will be settling up a codex monitoring cell in the first quarter of 1998. The main function of the cell will be to monitor the health and food standards of the food processing industry. Codex is the International food standards formed under the National Codex Committee in India in 1979. In November 1994, food laws were made part of the World Trade Organisation and under it, codex was made mandatory.

Earlier, codex was a minimum reference point and advisory in nature, but with India becoming the member of World Trade Organisation and having signed SPS and TBT agreement, codex has become obligatory. Till now, the health ministry was the nodal ministry for the codex committee. Now, the cell will be set up jointly by the ministries of health, agriculture and commerce with the food processing ministry taking the lead by earmarking Rs. 50 crores for this purpose. Members on the codex cell panel will include a Joint Secretary from commerce, agriculture, health and food processing ministries. The cell will also have an economist, scientist and a legal expert on the panel.

Rice Bran Oil Prices to Firm up

Rice Bran oil prices are expected to spurt in the domestic market following the recent escalation in the prices of substitute imported material, namely Palm Fatty Acid Distillate (PFAD). The situation would bring some relief to rice bran processing units, which have been facing depressing times because of poor off take of the indigenous oil. PFAD is widely used in the manufacture of soap. Increase in the prices of imported industrial raw material has already sent large soap manufacturers scurrying to cover the locally available rice bran oil. Prices of rice bran oil raw grade 2 meant for industrial purposes have been ranging between Rs.16,500 and Rs. 17,000 a tonne for the last three months or so. Bran processors had been rather unhappy with the competition posed by liberal imports of cheaper substitute. It is expected that the price escalation could be about Rs. 1,000 a tonne to reflect the latest increase in the price of PFAD. India imports approximately 1.5 to 2.0 lakh tonnes to palm by-products such as crude palm stearine and PFAD as industrial raw material. To provide protection to domestic procedures, a customs duty of 35 per cent *ad valorem* is levied on imports. During 1996-97, India produced 4.8 lakh tonnes of rice bran oil, out of which 1.5 lakh tonnes were used for non-edible or industrial purposes. Two lakh tonnes were consumed by the vanaspati industry, while the rest constituted refined oil for direct consumption.

Edible Oil Prices may Remain Steady Throughout This Year

Indian edible prices were likely to stay firm after a projected shortfall in the domestic crop. The 1997-98 summer soya oil seed crop was expected to be 5.5 million tonnes, but now it seems that the crop will not cross 4.8 million tonnes. So, the prices are likely to rule firm.

The oil yield would be hit due to quality problems. The summer mustard and rapeseed crop forecast at previous levels of six million tonnes might dip to 4.6 million to 4.7 million tonnes and trigger a price rise.

India's edible oil imports would grow in the current year because of a projected increase in per capita consumption and income levels. The consumption is increasing, but the domestic supply cannot match the demand, so there will be more imports and the prices are likely to remain firm. Edible oil imports in 1997-98 (November-October) were expected to increase to two million tonnes from 1.72 million in 1996-97.

According to Food ministry officials, India's demand for edible oil was growing at the rate of about 6.7 percent. While production was rowing at only 4.5 percent, India annually produces about seven million tonnes of edible oils.

Edible Oil Trade for Allowing Import of Oilseeds

Edible oils trade urged the government to allow the import of oilseeds to meet the domestic shortfall and help utilise the huge processing capacity currently lying idle.

If the Government allowed the import of oilseeds, it will help improve our capacity to generate additional employment opportunities and earn more foreign exchange through export of extractions. The current, idle, seed processing capacity has been about 60 per cent. This would reduce to around 50 per cent, if oilseed imports were allowed.

Domestic edible oil prices have risen by about 20 to 25 per cent since January. Trade officials said oilseed imports were necessary as high international edible oil prices were hurting the domestic trade.

India currently produces about 24 million tonnes of oilseeds annually. But still, it imports more than 1.5 million tonnes of edible oil to meet the domestic requirement. India could increase oilseed output by about 20 per cent mainly through modern, productivity-raising techniques.

It was difficult to increase the area under cultivation, which is about 26 million hectares (64.3 million acres).

The possibility of expanding the area under oilseeds is diminishing in real terms but can still be improved by resorting to intercropping mixed farming of oilseeds with other crops.

National Agro Marketing Policy on the Anvil

To prepare Indian agriculture for the post-2000 scenario, when the World Trade Organisation agreement would come into force, a proposal to formulate a national agricultural marketing policy has been mooted.

Initial discussions for drafting the policy have already started at ministry level. According to highly placed sources, the ministry of agriculture, which is currently holding brain storming sessions with other related departments and ministries expects to submit the draft policy in six months time.

The proposed policy will be an offshoot of national agriculture policy. It aimed at helping Indian agriculture become internationally competitive. It would emphasise on developing specialised markets, stabilising markets, introducing grading facility at production level and developing a market information system first at state level and then at block level.

On the cards is the introduction of grading facility right at the production stage in the villages. This would ensure that farmers only send saleable produce to market, saving on transport costs.

Markets catering to specific crops would be the order of the day. So, there would be a special market for grapes, Alphonsoe mangoes, Ranchi Cauliflower, and basmati rice.

At the national level specialised markets with proper quality control systems catering exclusively to exporters would be developed.

On the domestic front, emphasis will be laid on stabilising markets both in terms of price, quantity and timing of produce. This would require developing infrastructure like setting up cold storage facilities, food processing facilities and developing linkages to markets further away from the place of produce. Most importantly, the aim is to have a proper market information system in place over the next ten years.

With price information available on Nicnet (a computerised system linking up markets at stage level and later at block level) an apple grower in Himachal can ship his produce to Pune market where it could fetch a much higher price than offer it to the Delhi markets as usual.

Keeping in mind the increased international consciousness for organically produced food, stress would be laid on encouraging farming methods using organic manure, thereby enabling farmers to fetch a better price.

Dip in High Growth Areas Hits Exports

The poor show on the export front for the 10 month period ended January 1998 can be attributed to sharp falls in several high growth areas like rice, fruits and vegetables, minerals, leather goods, electronics, petro-products and jute. According to the latest trade figures released by the government,exports grew by a mere 2.37 per cent for the 10 month period of April-January 1997-98.

The reasons for the fall are also not completely due to recessionary trends in the world. They are more due to the lack of a clear cut export policy for many of these products, which form a major part of the export basket.

Among the products which have shown a negative growth in exports for the financial year of 1997-98 are rice, which has come down by 12 per cent in rupee terms from the last year's level of R. 2,300 crore of exports. The export of this product for the 10 months period are Rs. 2,100 crores. Fruits and vegetables have witnessed a 6 per cent fall. Minerals, which stood at Rs. 2,000 crores of exports last year now stands at Rs. 1,800 crores signifying a 9 per cent fall.

All these products have been mainly hit due to the stop gap policies being adopted by the Centre in dealing with exports. Exporters need stable policies for meeting the demands around the world and this cannot be achieved, if the government keeps changing its stand on the possibility of exports of these products.

Government to Allow Futures Trading in More Agri-commodities

The Union government has decided in principle to widen the band of futures trading in agro-based commodities and remove the quantities restrictions in commodity trading in phases.

The secretary of the Union ministry of food and consumer affairs, Mr. N.N. Mukherjee disclosed that the World Bank had granted Rs. 2 crores for the promotion of forward trading on the com-

modity exchanges in the country. The objectives are three-folds: to strengthen the functioning of Forward Markets Commission (FMC), to modernise the existing commodity exchanges and setting up new ones and to establish market monitoring and surveillance.

He said that at the moment, nine agro-based commodities were in the futures trading list on the indigenous commodity exchanges, while two more like pepper and castor oil were allowed for international futures trading. As a member of the WTO agreement, India has also decided to remove quantitative restrictions (QRS) in commodity trading in three phases over the next six or seven years.

The first phase was expected to be completed in three years followed by two years for the second phase and one or two years for the third phase. It was expected to start with withdrawal of QRS on oilseeds. He also indicated that if the new government was responsive, futures trading in edible oilseeds was likely to start shortly.

Sugar Industry Growth Stunted by Controls

The Indian sugar industry is operating with a set of rules that is unfair and its growth is, therefore stunted according to a top official of the Indian Sugar Mills Association (ISMA).

The rules governing the industry were unfair as it was forced to sell a part of its output at subsidised prices, but on the other hand it had to face foreign competition.

The government allowed free sugar imports in 1994-95 to keep a check on prices after a fall in production. Sugar production has since picked up, but the government has continued with its policy of free import, which has depressed local prices. India is the world's largest sugar producer. It recorded an output of 12.9 million tonnes in 1996-97 (October- September).

Traders have registered to import about 359,000 tonnes of sugar since the start of the 1997-98 season.

The government has eased controls on many industries as part of a seven-year-old liberalisation process, but sugar still remains a highly regulated sector with government controls on production and pricing.

Trade officials have said freeing up the sugar sector would help boost India's output and trigger exports in a big way.

Australia's New Meat Inspection System Defended

Australia defended a new meat inspection system rejected by the United States and said it had no intention of using American consumers as guinea pigs to try it out.

Australian media reported that the US Food Safety and Inspection Service (FSIS) had written to Canberra saying that a move to industry run inspections would not provide adequate assurance of meat safety and the United States could not accept meat exports under the scheme. United States was the only country out of 110 that import Australian meat to raise any objections.

The system has been tried in Australia and demonstrated very significant improvements in meat hygiene. It is the Australian system and by world standards, best practice.

A key component of the new system is a transfer of responsibility for meat inspection from the government to industry under government supervision and audit reforms, which would lower costs and increase competitiveness.

The United States believed the rapid withdrawal of a number of meatworks inspectors would leave Australia, unable to guarantee that improved inspection results would be maintained.

The United States was not refusing to accept all Australian beef, but they did not want to take beef that was being piloted under the inspection project.

FDA Changes Food Norms

The US Food and Drug Administration (FDA) has changed milk labelling norms from the new year 1998 with two per cent milk no longer "low fat". Further in a move to reduce birth defects, food manufacturers are required to add the nutrient folic acid to enriched breads, flours, corn meals, pastas, rice and other grain products.

The new labelling requirement brings milk in line with other products. In 1993, the FDA defined "low fat" food as those which have less than three grams of fat per serving. It exempted milk from this because " standards of identity" for low-fat milk were set before 1990,

when Congress passed the Nutrition Labelling and Education Act. The new rule revokes that exemption.

Non-basmati Rice Varieties to be Split into 2 Categories

In a move which will radically alter India's rice industry, the Union government plans to split non-basmati rice into two new categories to ensure that the superior varieties get a premium in the world market.

At present, India classifies its rice into only two categories: non-basmati (which includes more than 35 varieties) and basmati.

According to the new classification, India will now have three categories: Indian long grain (with around 20 varieties of normal long grain), Indian aromatic (with around 10 superior varieties), and basmati. The new category of Indian aromatic rice will be more expensive than normal long grain but cost lower than the traditional basmati.

The decision follows a recommendation by the Basmati Seed Multiplication Committee, set up by the commerce ministry, to split the existing two categories of rice into three. The committee was set up to establish the criteria for classifying basmati and the different varieties of rice grown in India.

The government is also contemplating freeing Indian aromatic rice from the requirements of levy. At present, all non-basmati rice has to meet a levy quota, which varies from state to state, while basmati is free from any such obligation. By not levying a quota on Indian aromatic, the government would, therefore, be permitting larger quantities to be available in the open market for retail sales and exports.

The reclassification of non-basmati has become necessary in order to ensure that superior rice varieties, apart from basmati, are able to create a niche for themselves both in the domestic and global markets.

The commerce ministry has already launched a major media blitzkrieg to encourage farmers to grow only "real" basmati in the country. The Rs. 20 lakh campaign is being financed by the Basmati Development Fund set up last year.

By creating a new category of rice, farmers will be able to sell aromatic rice under a distinct brand name.

Indian Seafood Export Units Await EU Team's Inspection Reports

A four-member expert committee from the European Union is to visit two seafood units, one each from Mumbai and Kochi and may be one more in Chennai if time permits. The inter-departmental panel and special audit team, which consisted of experts from Marine Product Exports Development Authority (MPEDA), Central Institute of Fisheries Technology (CIFT) and Export Inspection Agency (EIA), had short-listed less than 10 units in India for inspection. Three units from Maharashtra are also in the list. The delegation will apprise complaints filed by earlier EU committees and assess whether the EIA, the sole authority permitted to conduct quality checking of export units, has rectified the error. The ban on Indian seafood exports to the EU may be lifted soon after the committee files it report, sources close to the European Commission in Brussels revealed.

India Asks for Time to Enforce Seafood Quality System

The seafood industry in the country is passing through a period of crisis. The ban imposed by the European Union has adversely hit the export sector in the industry. At the same time, the deadline for the adoption of the HACCP quality system imposed by the US is fast approaching. As regards aquaculture, the Supreme Court is yet to give its final verdict on the case.

According to the Chairman, MPEDA, India might require an extension of time for the introduction of the HACCP quality system, which is being imposed by the US.

MPEDA has registered an improved performance as far as exports of seafoods are concerned. In the April to October period of last year, India exported 4,000 tonnes more than the exports during the same period of the previous year. As far as value of exports is concerned, the increase is nearly Rs. 200 crores in the April to September period of 1997-98 as compared to the same period of the previous year.

Looplocker-1: A New Automatic Closing Machine

At the International Bakery Exhibition (IBA) in Duseldorf (Germany), Schutte Bagclosures would have presented a new automatic closing unit the LOOPLOCKER 1, which can close all kinds of different bags, with the wireless closure Multilooplock at a speed of 70 products per minute. The Multilooplock is closed tamper evident (sealed).

This closing unit can be put into use on existing packaging lines without many adjustments. The closing unit LOOPLOCKER 1 uses the wireless closure, the Multilooplock, which is made entirely out of polypropylene. Additionally, there are no metal detection problems using this closure and it provides several other advantages: This closure is completely made out of polypropylene; is recyclable; is reclosable; is tamper proof; is usable both on PE and PP bags; can be printed upon and is suitable for microwave oven use.

For additional information: Schutte bagclosures, Brouwerstraat 8, 5405 BK Uden (Holland); Tel: + 31 413 264 776; Fax : + 31 413 266 145; E-mail : schutte@schutte.nl; IBA: Hall 3, F50 / G49.

Sesame Oil in A New Packet

Tradition sells, provided it is packaged well. The sellers of Tamil Nadu's traditional cooking medium, 'til', (sesame) oils, are learning this by heart. Watching every newcomer in the edible oil area erodes their marketshare, they are now trying to make a comeback with aggressive brand building, advertising and attractive packaging.

Virudhunagar is a traditional centre for 'til' oil for over five decades. Till the mid - 1980s, 'til' oil manufacturers in towns such as these had been selling the oil in tins to retailers. With time, the strategy no longer remained attractive. V. V. Vanniaperumal & Sons first converted til oil from a bulk commodity to a packaged product, branding it 'Idhayam'. As the Indian middle-class was becoming health and calorie conscious, Idhayam's commercial drove home the point that it reduced cholesterol levels.

'Idhayam' commands a 60 per cent marketshare in Chennai. The 'til' oil share otherwise is 30 per cent in Chennai's edible oil market. Coconut and refined oils command a 60 per cent share. 'Idhayam' gained an edge over the competition not just in brand building but also in distribution. It has already been selling in Singapore, Sri Lanka and Dubai and is looking at Malaysia and China. In fact, it recently launched a premium brand a 'Idhyam Delit'. Its turnover, not suprisingly, increased from Rs. 7 crores in 1986 to Rs. 50 crores in 1997.

Ostrich Jitters

It's healthier than red meat, more nutritious than chicken. Ostrich meat makes sense. But India's first attempt to start an ostrich farm near Mysore has come a cropper. Chief Minister J. H. Patel said that no ostrich farming would be allowed after fierce opposition from animal rights activists, environmentalists and even the state Forest Department, which opposed a proposed farm near the Nagarhole National park. A report from South African farms says that ostriches have contracted diseases that could spread to other animals. The Government's opposition to ostrich farming is a *volte face.* AgricultureMinister C. Byre Gowda inaugurated an ostrich-farming conference in November and encouraged farmers to increase their income by raising ostriches. Who's got their heads in a hole then ?

Monsanto to Build Eco-friendly Reputation

Monsanto is a company with a disturbed past. A favourite target of environmentalists, the inventor of a highly polluting substance called PCB, the manufacturer of the infamous Agent Orange used in the Vietnam war and the producer of dioxins; the Monsanto brand name has a lot of bad history.

But when the company decided to spin off its chemicals division into a separate company, the biotechnology section decided to stick to the Monsanto name. Monsanto has repositioned itself as life sciences company concerned with "food, health and hope".

Genetically engineered crops are being increasingly touted as the only way to improve yields to feed the burgeoning world population. Their main feature is the ability to withstand attacks from pests and weeds. So, farmers will not have to use dangerous pesticides in large quantities.

Nothing could be more environmentally friendlier than 2 transgenic crop with built-in resistance to pests.

Amul Wins A Race

Amul, the flourishing Indian dairy brand from Gujarat Co- operative Milk Marketing Federation, will soon emerge as a market leader in ice-creams in the east. Amul has beaten international majors like Hindustan Levers and Haagen Dazs to enter into an agreement with Metro Dairy Ltd in Calcutta, a Rs. 50 crore joint venture between the West Bengal government and Mahendra K. Jalan of Keventor Agro. The joint venture, which has an ice-cream plant with an installed capacity of 10,000 litres per shift, has decided to let out its facility to Amul rather than to any international player. Amul is now planning to launch its ice-creams in Calcutta by April to catch the summer season.

Bio-degradable Plastic in Market Soon

The ubiquitous plastic carry bag may no longer be such an eyesore-choking drains or lowering the water table. A fully bio-degradable plastic, developed indigenously, is all set to hit the market this year.

Obtained by combining strach and low density polythene (LDPE), the plastic is found to have "adequate mechanical strength and took only two months under soil burial for complete degradation," according to Mr. Ashok Parthasarthi, Secretary, Food Processing Industry.

The National Research Development Corporation (NRDC) is working on the project to commercially develop the plastic bags, which may be available in the market this year, according to Dr. D. K. Bhardwaj, General Manager, NRDC.

Granules made of 10 per cent to 40 per cent of strach and LDPE and a 'binding agent' which is imported, are used to make the 'bio degradable' sheet, which could revolutionise the packaging scenario in an increasingly environment-conscious world. The starch component, being organic, degraded in the soil and once the molecule of the compound broke, its vulnerability to bacterial attacks increased resulting in its disintegration, he said.

The invention, however, is the brainchild of Dr. S. K. Nanda of IIT, Kharagpur, who developed it about a couple of years ago and successfully demonstrated degradation in soil under laboratory conditions in 60 days.

The NRDC, which has been assigned the task of exploring its marketing and commercial viability, has applied for its patent. Dr. Bharadwaj said that the manufacturing cost of bags made of the new material was barely, 25 per cent higher than that of conventional plastic bags.

Other qualities, which could make the sheet a good packaging material are printability. Results after printing or embossing on the sheet are better than on available sheets, which could add to the presentability factor in packaging.

India Seen as Good Investment Pocket

American investors believe that India has grown to become a good investment destination despite political uncertainty, bureaucratic hassles, shortage of power and infrastructural deficiencies.

A survey of 135 American companies, whose estimated market value of investments stood at $ 2.1 billion, reveals their perception that India's economic growth during 1997-2001 will be 'substantial'. The survey was the third conducted by the US embassy in Delhi.

Although the US investment share in the manufacturing sector has declined marginally by 1.40 per cent from 48 per cent, the American investors foresee higher growth in virtually all sectors.

These companies think growth will be substantial, particularly in the energy sector, which accounts for about 72 per cent of the total projected investment of $5 billion, the survey said.

US companies perceive that major investments will be going into banking, computer software and manufacturing. However, growth in areas like agriculture and transportation continues to be inhibited by policy restrictions or the shortage of private sector experience, the survey said.

Investments in professional services, including sales and distribution are projected to reach $ 137 million in the next four years. However, growth in areas like agriculture and transportation continues to be inhibited by policy restrictions or the shortage of private sec-

tor experience, the survey noted.

The favourite destinations of Americans are the major metropolitan areas of Mumbai, Delhi and Bangalore. The survey projects that Maharashtra will continue to dominate US investment over the next five years. While 67 per cent of total projected US investment during 1997-2001 will go to Maharashtra, 14 per cent will be in Delhi and 9 per cent in Karnataka.

The other major recipient of US investment is Tamil Nadu with $ 212.5 million projected for the same period, constituting 4 per cent of the total. The state is also considered as having a lot of potential investment in states like Orissa. The survey noted that no investment was reported for Punjab and Madhya Pradesh, which have strong agricultural bases and offer prospects for agro-based industries and power plants.

The survey said 79 of the 132 respondent American companies felt that the investment climate in India in general is good, particularly in western and southern states.

India may Import 5 mt of Wheat

Faced with a poor harvest this year, India is expected to soon import half a million tonnes of wheat to shore up its buffer stocks.

The State Trading Corporation (STC) has sought permission from the food ministry for floating the tender, which is likely to be granted soon, industry sources said. The wheat will be shipped in before March 31.

The STC already has an outstanding import authorisation for around 1.3 million tonnes, against an import authorisation of 4 million tonnes. Last year, STC had imported only 2.7 million tonnes. The tendering terms and conditions are expected to remain unchanged from last year's. In fact, given the current production, procurement and stock prospects, additional wheat imports of more than 5 lakh tonnes are likely during 1998-99, source said.

According to sources, wheat stocks are depleting fast because the domestic wheat prices have risen in recent times, compelling the government to release more wheat from its stocks for the public distribution system.

To contain the price rise, the government recently decided to resume the open market sale of wheat at the rate of 3 lakh tonnes per month during January-March, taking the total monthly allocation to 1.1 million tonnes per month.

This will result in a significant draw down in government carry over stocks for the next marketing year, starting April 1.

Moreover, untimely heavy rains and cloudy weather combined with below normal temperatures during December and early January in northern India are likely to lower 1998 wheat harvest from the record 1997 production.

Industry experts opine that a decline of 2 to 3 million tonnes from the last year's record level of around 68.9 million tonnes appears likely.

India may Have to Import Rice by 2005

India, which is the second largest exporter of rice in the world may have ro resort to importing it by the year 2005, if the current recession in rice production continues, according to Dr. R. K. Singh, co-ordinator of the South Asia rice production in International Rice Research Institute, Manila.

Dr. Singh who is also the former director, research of Narendra Dev, University, Faizabad urged the centre to adopt appropriate technology and support research and extension work to enhance rice production to meet the requirements of the country and also to increase rice exports.

He pointed out that rice production in the country had witnessed a substantive stagnation with a yield of only 82 million tonnes per year and the per hectare production recording less than the rest of the world.

As a corrective step, Dr. Singh advised the farmers to use high yield variety of rice like the one developed in the Rajendra Prasad Agriculture University, Pusa. Differentiating between the variety of rice developed in India and the world, he said, in China and other countries, farmers use high yield hybrid variety, which is ideal for irrigated areas, while in India 60 per cent of the rice cultivated is produced in rain-fed areas.

China may Import More Wheat in 1998

China is likely to import more wheat this year to meet possible short fall in output and falling prices last year.

As domestically produced wheat can not meet market demands, China is expected to import more wheat in 1998 than in 1997, but much less than in 1995 and 1996.

The official China Daily reported that wheat prices in the Chinese market may go up in 1998 due to the lower production and falling prices witnessed last year.

Most of the wheat producing provinces in China suffered severe drought since last October, the per-unit wheat production in 1998 will be lower than the previous year. Consequently, the total output will be less than 1997's record high of 122.6 million tonnes.

According to data released by the government, grain output in 1997 is expected to touch 492.5 million tonnes in China, a record high in two years running.

Saudi Bans Imports of Some Agri-Products

Saudi Arabia has temporarily banned imports of some agricultural products to protect local farmers.

But the ban, reported by the English-language Arab News, did not include the kingdom's huge barley imports.

The ministry of agriculture and water has imposed a ban on certain agricultural commodities to protect the local produce.

It is said that the ban, expected to last for up to seven months from January 1, included tomatoes, potatoes, onions, melons and other products.

But the list did not include barley, despite an earlier report that the kingdom could suspend imports as it worked on alternatives.

Saudi Arabia, the world's largest importer of feed barley, is halfway through an annual programme of purchases forecast at up to six million tonnes.

Saudi Arabia said that in October, it would limit imports of some agricultural produce during the harvest season. Jordan, Lebanon, Syria, Turkey, Egypt are among the main fruit and vegetable exporters to Saudi Arabia. European vegetables are also found on Saudi super market shelves.

Arab News quoted a spokesman for the Riyadh Chamber of Commerce as saying that the ban was in line with a cabinet decree to protect local farmers.

Saudi Arabia's five-year development plan to the year 2000 aims at achieving an annual average real growth rate in value-added by the agricultural sector of 3.1 per cent, with farming's share of non-oil gross domestic product expected to be about 9.9 per cent by 2000.

Processed Food Exports Touch 2.1 Billion Dollars Worth

Exports of processed food have touched a record level of $2.1 billions during 1996-97 from a level of $757 million barely five years ago, said the Commerce Minister, Mr. B. B. Ramaiah, while addressing the export awards function of the Agricultural and Process Food Products; Export Development Authority in New Delhi.

He said the agricultural exports today constituted almost 20 per cent of the total exports. This trend, he felt, must continue at all cost to ensure a comfortable balance of trade.

The Minister urged the processed food sector to capitalise on India's inherent strengths of a large agro-production base and strive to achieve at least 1.5 per cent share of the global trade by the end of the century. The target should rise to five per cent by the end of the first decade of the next century in the agro-processed food sector.

He said that though there were many hurdles in the way of exports such as problems of credit, infrastructure and trade barriers, several measures had been taken by the Government to liberalise agricultural trade to promote exports. Thus, the minimum export prices had been removed and most items decanalised.

He said that the Government was committed to extending full support to the agro and processed food sector to improve export infrastructure, which should be the focus during the Ninth Plan period. The Minister also urged

exporters to pay special attention to quality in the light of the stringent legislation being introduced for many items by importing countries.

The APEDA chairman, Mr. D. Rajagopalan, said in spite of recessionary trends in the world markets and serious domestic constraints like lack of infrastructure, there, had been a healthy growth in most major product segments. Apart from increase in quantity and value of exports, a significant development was the diversification of products and markets. Exporters of processed fruits and vegetable products who used to supply mainly to the then Soviet Union had been able to find alternative markets in West Asia, Europe and the Far East. Besides, table grapes, processed mushrooms and branded fruit juices had been added to the export basket.

Boards to Prescribe Norms for Quality Certifying Agencies

The Government has decided to set up three separate accreditation boards to lay down standards for various quality certifying agencies in the country.

These accreditation boards will function under the recently constituted Quality Council of India (QCI), Mr. P. S. Das, Director -General of the Bureau of Indian Standards (BIS).

While the first board is for the ISO 9000 and product and systems quality certification, the second board will bring guidelines for quality system auditing and the third pertains to testing and calibrating laboratories.

The certification procedure of the first board includes the audit of quality system and process and product audit to assess that processes are under control and end product conforms to the customer needs.

The Federation of Indian Chambers of Commerce and Industry (FICCI), which was entrusted with the documentation of the first board, has already submitted its recommendations to the QCI.

At present, three government bodies and 14 private firms provide ISO 9000 certification in the country. While the three government bodies, including BIS are accredited by the apex accreditation body of the Netherlands, the private firms are accredited to various accreditation bodies based in Europe and North America.

Quality system auditors, trainers and institutes imparting training on quality system auditing will be monitored by the second accreditation board. The board, in addition to approving training centres and course syllabus, will also maintain a register of qualified auditors in the country.

At present, there are about 4,000 auditors in the country, whose qualification to obtain registration is a five day course and necessary experience in the field of quality checking.

The documentation of this board has been entrusted with the Confederation of Indian Industry (CII). Industrial consultants are also likely to be brought under the purview of this board in view of the increased demand from industry to accredit the consultants.

The third accreditation board will certify the testing and calibrating laboratories which undertake testing of product quality.

Any laboratory that conducts such testing can apply for accreditation from this board though it is not mandatory. Preparatory work of this board has been done by the Department of Science and Technology.

In addition to these boards, the QCI is also embarking on two other projects aimed at disseminating quality awareness in the country.

The first project, National Information Enquiry Service (NIES) will provide all necessary information regarding national and international quality standards. NIES, which will function under the BIS, will also provide quality standards stipulated by India's trading partner countries and mandatory technical regulations prescribed by certain other countries.

The technical information centre of the BIS will be upgraded to undertake the requirements of NIES.

The second project named National Quality Campaign (NQC) will be undertaken by the National Productivity Council (NPC) and will strive to create awareness about product quality in the country.

All the three accreditation boards as well as NIES and NQC will go full steam after the QCI commences its operations.

MTR Foods Setting up A Vermicelli Unit

The Bangalore-based MTR Foods Ltd is setting up a new plant for producing short-cut vermicelli to cater to the growing domestic and export market. The new plant with a capacity of 1,000 Kg per hour is claimed to be the biggest in Karnataka.

The project is being executed by Pavan Spa of Italy, a major engineering consultant in food processing technology. Once the new project becomes operational, the closely-held company is likely to give a tough competition to the other major vermicelli makers such as Bom-bino, True Foods, Savaroite and Lingraj.

At present, the company is catering only to Karnataka and Andhra Pradesh markets. With new project, it will target the entire country, said Mr. P. Sadanand Maiya, Managing Director. Total project cost is estimated to be around $2 million.

The company's existing plant at Bommasandra in the outskirts of Bangalore has a capacity of 700 kg per hour. With the new plant, Mr. Maiya plans to focus more on the export markets in countries such as Germany and the US. As there is a growing demand for Indian Vermicelli abroad.

The company has just begun exporting vermicelli to Malaysia, Singapore and the US. It has its own distribution networks there to sell it under the brand name MTR.

MTR Foods, a traditional exporter of species and pickles, currently exports them to the South East Asia, England, the US and European countries.

CII's Initiative for Agricultural Reforms

Indian agriculture despite the mainstay of two thirds of the country's population and accounting for about 30% of the GDP remains a relatively neglected sector, barely touched by the reforms which have shown remarkable impact on the other sectors of the economy. Agriculture and its allied activities hold great potential for speedy development over the coming years. The nation has achieved self sufficiency in foodgrain production in the post-independence era and there has been surplus of around 20 million tonnes during the year 1996-97. We are also the world's second largest producers of vegetables and fruits. The country has a favourable climatic pattern, vast cultivable tracts on which almost entire range of crops can be grown and has a large base of cheap and skilled manpower. Yet, there is a need to raise the level of productivity and quality of agri-commodities to meet the requirements of domestic as well as global markets.

In order to have food and nutritional security for the teeming millions in the coming years, the overall growth rate of agriculture needs an enhancement to 4.5% from the present level of 3.7% and this would require an investment to the tune of Rs. 2,20,206 crores at 1996-97 prices during the ninth plan, which is nearly 40% higher than in the eighth plan. Agriculture and its allied sectors are projected to get about 19.4% of the total plan outlay of Rs. 8,75,000 crores. Exports of agri-commodities have also registered a good growth over the last few years, but despite all these achievements and growth prospects, agriculture and co-related activities remain in an unorganised sector with large number of small and medium producers and very few major players. It is also a highly over-regulated sector of our economy.

Some of the major constraints to the speedy growth of agriculture and its allied activities are shortfall in public investment due to increase in subsidies for input viz., seeds, fertilisers, irrigation, electricity, food etc. There is a lack of timely availability of credit to the farmers and an inefficient supply system of raw materials to the producers and processors. Farmers have been unable to fully utilize the irrigation potential available to them. India loses about 30% of its agricultural produce due to insufficient infrastructure for transportation, storage and other processing purposes. Further, stringent agri-related policies, lack of dissemination of information from the research institutes to the farmers and minimal corporate involvement have also held back the desired investment and development.

There is a pressing need to incorporate reforms to revive this sector. Steps like gradually phasing out the subsidies, adopting state-of-art technology like HYV seeds and modern cultivation and processing practices, reviewing the backward and forward linkages, deregulating and expanding agri-markets, strengthening the infrastructure to prevent post production losses are required to attain sustainable growth. A pioneering step has been taken in this direction by Confederation of Indian Industry 's National Committee on Agriculture. This committee has come up with an agenda for reforms in this sector, which favours involvement of corporate sector through contract farming. It also proposes

gradual reduction of subsidies for various inputs like fertilizer, irrigation, electricity, etc, in order to bring in the required finances in the public sector investment and deregulation of agri-markets.

CII in partnership with Mckinsey & Company carried out an extensive study on the potential of the food industry in India and prepared a report "FAIDA" i.e., Food and Agriculture Integrated Development Action. The objective of this was to analyse the growth potential of this industry, its investment potential and to build a partnership among the industry's participants viz., the farmers, the food business and the policy makers.

In the present scenario, credit facilities play a crucial role for various operations of small and medium producers and processors. There has been substantial increase in the volume and coverage of the agri/rural financial institutions, like primary agriculture credit societies (PACs), regional rural banks and commercial banks. In the short-term advances during the financial year 1995-96, PACs accounted for 59% of the total disbursement, commercial banks had a share of 35% and RRBs provided the remaining 6%. For medium and long term credit investment commercial banks ranked first with 58% of the total, PACs contributed 35% and regional rural banks accounted for 7% in the same duration. NABARD has promoted state level agriculture development finance companies (ADFC) in the States of Andhra Pradesh, Karnataka and Tamil Nadu. The main purpose of these companies is to augment credit for commercial hi-tech agriculture, export-oriented agriculture and allied activities, including infrastructure and support system.

In spite of such impressive figures and developmental measures, there is high depedence of the farmers and the allied creditors on the independent moneylenders. This could be attributed to complex nature of lending procedures of credit institutions, lack of specific time schedule for the sanction and disbursement of loans, no credit facilities for contingent needs of the farmers, no transparency between the lenders and the borrowers. Further, high risk of defaults by the creditors and concessional rates of interest have kept the financiers away from the creditors. So, one can conclude that there is a need for restructuring the credit facilities to the resource-poor producers and professors because of its crucial role in the operations of agricultural and allied activities like horticulture, floriculture, fisheries, livestock, dairy and processed foods.

Indo-Swedish MoU on Energy, Environment and Food Processing

India and Sweden will sign a memorandum of understanding (MoU) on research collaboration in energy, environment technology and food processing within the next two months. The MoU, to be signed by the Department of Science and Technology (DST), Swedish International Development Agency (SIDA) and Swedish Research Council for Engineering Sciences (TFR) will reorient previous joint programmes of the two countries from assistance mode to research co-operation according to V. S. Ramamurthy, Secretary of DST. Work on specific projects will start by early 1999.

Collaboration in food processing will include 14 sectors such as biosensors to identify pesticide residues, pathogens and heavy metals, biopreservation, enzyme application and manufacturing systems, packaging based on biopolymer films, by-product utilisation, biodegradable emulsifiers and sugar substitutes derived from natural sources like proteins and algae. Areas identified in energy technology include gasification and combustion technology, fuel cells, flyash, drilling and blasting technology, solar optical materials, solar-assisted heat pumps, energy systems,clean coal technology, phase change material, energy storage and ethyl alochol production. Joint projects identified in environment technology include water treatment and management, traffic safety, catalytic combustion, air pollution modelling and biotechnology for cleaner production. India and Sweden are already collaborating in eight projects of six-year duration. But the projects selected under the new MoU will be of three-year duration. The two countries have also agreed to explore scope for cooperation in advanced materials, robotics and automation.

VIEWS

Population, Poverty, Food Security and Future

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(The 'VIEWS' Column is intended to permit eminent consultants, academicians and policy makers to air their views on matters of prime importance to the Indian Food Industry. It is hoped that this will facilitate to set in motion the process of serious thinking, situation assessment and action planning among the concerned people. It could also serve as a forum for debate where diverse opinions and views are expressed. Towards these ends, the VIEWS column, which as of now will be on invitation, will allow freedom of expression, not necessarily congruent with the Journal's views. (Chief Editor)

We have our own unique way of solving (absolving) pressing problems. How often have we heard on the urgent need to contain Indian population, which is eating into our vitals of survival. I wish to avoid complex statistical data which are available in plenty, as this may distract the main issues I wish to address. China has nearly achieved zero population growth, while India has the dubious distinction of being the fastest growing country with an annual growth rate of 2.2%. The Registrar General of India has projected a population of 1.26 billions by 2016 AD, half of whom will be illiterate and 380 millions unemployed. Nothing is in the horizon to challenge these figures except for sincere prayers that this doesn't come true. (Table 1).

Hunger cannot be dissociated from socio-political and economic deprivations, requiring broader approach in policies.

Prof. Amartya Sen, a renowned Indian economist (presently at Cambridge College) had stated that hunger is not related to food production. Hunger cannot be dissociated from socio-political and economic deprivations, requiring broader approach in policies. India remains in 'stark contrasts and disparities', with 53% of under-nourished children and systematic deprivation of women. Governmental claims of surplus availability of food are often misleading, as people at grass root level have no economic access.

Table 1. Poverty in 2000 AD

	Incidence of poverty (%)		Number of poor (million)	
Region (year)	1985	2000	1985	2000
China	20.0	2.9	210	3.5
India	55.0	25.4	420	255
Developing countries	32.7	18.0	1125	825

Based on world development report (1990). Poverty line as $ 370 Annual income.

Table 2. Indian Foodgrain Requirements, Present and for 2000 AD (in million tonnes)

Grain	1990	2000
Rice	72.0	96.0
Wheat	55.0	72.5
Coarse		
Cereals	31.9	39.0
Pulses	13.2	21.0
Total	172.1	228.5
Oilseeds	10.9	14.0

It is to be accepted that world has achieved better material condition in 50 years than in the last 500 years. However, the relative progress and availability of resources have never been on level playing ground. Over 700 million people world over are hungry of which 330 to 440 millions are in SAARC region alone. World Development Report (WDR 1990) has stated that there is considerable potential for progress towards reducing poverty in India from the present 55% to 25.4% by 2000 AD. Even seven years after these projections, realities reflect a totally different picture. In this context, it is relevant to mention that the Human Development Index (HDI) sometimes referred as Human Poverty Index developed by UN agencies is a litmus paper for the general well being of a country (Fig.1). This index takes into account, vulnerability to death at early age, prevalence of illiteracy and access health systems and availability of safe drinking water and adequate food. It is a matter of grave concern that India has a low rank of 123 out of 160 countries surveyed in 1990 and the position has further fallen to 138 among 175 countries in 1997.

Containing population pressure demands greater efficiency in organising food production systems. According to FAO (Food and Agriculture Organisation, 1992), agricultural production has globally declined in 1991 between 4-8% with only minimum recovery in 1992. Of the 400 million farming families in the world, 100 million each live in India and China. In the present situation, agricultural productivity has to be linked to sustainable development, which alone can provide food security. Food grain requirements by the turn of the century are shown in Table 2.

In the present situation, agricultural productivity has to be linked to sustainable development, which alone can provide food security.

We need more than a green revolution to meet the basic needs. This takes us to the need of 'Sustainable development' which is strongly advocated by Dr. M. S. Swaminathan. Sustainable development is one that meets the needs of the present without compromising the ability of future generations to meet their own needs. In operational terms, this creates problems in distinguishing sustainable development from sustainable growth. This has to improve the quality of human life, while living within the carrying capacity of supporting eco-systems.

Sustainable agricultural systems are economically viable, meet societal needs for safe and nutritious food, while conserving or enhancing natural resources and the quality of the environment for future generations. Sustainable agricultural production is dependent on sustainable resource use, which involves environmental accounting, crop yields and crop carrying capacity of the system.

Food Security

Food security may be defined as the ability of food deficit countries or region or households within their countries to meet target consumption levels on an year to year basis. It will be more practical to compare this on the levels of consumption as the target than on nutritional basis. Insecurity in food is always associated with fluctuations in food production and changes in its price. Food surpluses reported from time to time in our country often may not always mean food reaching the vulnerable sections of the population due to poor economic status. Food insecurity may force a downward trend in per capita consumption from already unacceptable low levels and affect nutritional and health standards.

It has been suggested that our country should opt out of the world security systems, not depend at all on the food imports, raise our level of self sufficiency and build our own reserve stocks. This is mainly because of high unreliability in international supplies, which are often linked politically. Our country has to give maximum attention to agriculture in order to 1) assure basic food security to the people, 2) improve the abysmally low nutritional standards and 3) create surpluses for poverty alleviation programme.

The technological developments that are likely to have the greatest impact on food production should also emphasize simplicity, low cost, labour intensiveness and appropriate knowledge. With all scientific progress made in agricultural field gambling with fickleness of monsoon has become a great stumbling block. With over 75% of cultivated land area in India being dependent on rain, this is a very high risk indeed. Besides, use of high yielding varieties needs careful inputs of fertilizers, pesticides and irrigation which only some sections of farmers can afford. Newer varieties to be developed should aim in getting varieties, which are drought/salt resistant and needs minimal fertilizer inputs.

The technological developments that are likely to have the greatest impact on food production should also emphasize simplicity, low cost, labour intensiveness and appropriate knowledge.

Water - The life Line

The irony of Indian agriculture is availability of water for irrigation, which only 25 to 30% of land is privileged to get, while vast majority of lands are dependent on the unpredictable monsoon, as the lands are primarily rainfed. Fine cereals like rice and wheat crop are perhaps better irrigated. Food grain production in India in 1991-92 was 167 million tonnes as against the target of 182.5 million tonnes. Lack of irrigation for edible oil seed production has necessitated massive imports in the past to meet the minimal needs of the country. Coarse grains, which contribute to about 18.7 percent of foodgrain production and give sustenance to rural population, have alarmingly diminished from 39% to 19.7% in the last forty years. Production of pulses, a primary source of protein has been stagnant at 11.5 to 13.0 million tonnes per year in the last 25 years. All these are primarily for the want of irrigation water. As the coarse grains are the mainstay of the rural population, this should not be ignored in favour of fine cereals.

Producing more food and agricultural products from less and water and energy needs a combination of innovative modern technique with ecological necessities and traditional experience of farmers.

This brings the divide between not only the rich and poor among farmers but also between the states in a country, which is primarily dependent on agriculture. Effective water saving, equity in water sharing the efficiency in water delivery and use are important for sustainable management of available ground water resources. This has to be viewed in a global scenario, where the need of water as a resource has doubled between 1940 and 1980 and will redouble by the turn of the century. Of this, 2/3 of water goes to agriculture. Forty percent of world population including large countries like China and India experience perennial and serious water shortage. With rapid industrialization and increasing population, availability of water for irrigation is threatened even more.

It will give no comfort to state that sharing of river water between nations and within has become a politically sensitive issue in several countries. Ground water resources are being exploited by private groups and a source of lucrative business. The only alternative seems to be solar desalination of sea water, if it can become an economic pro-

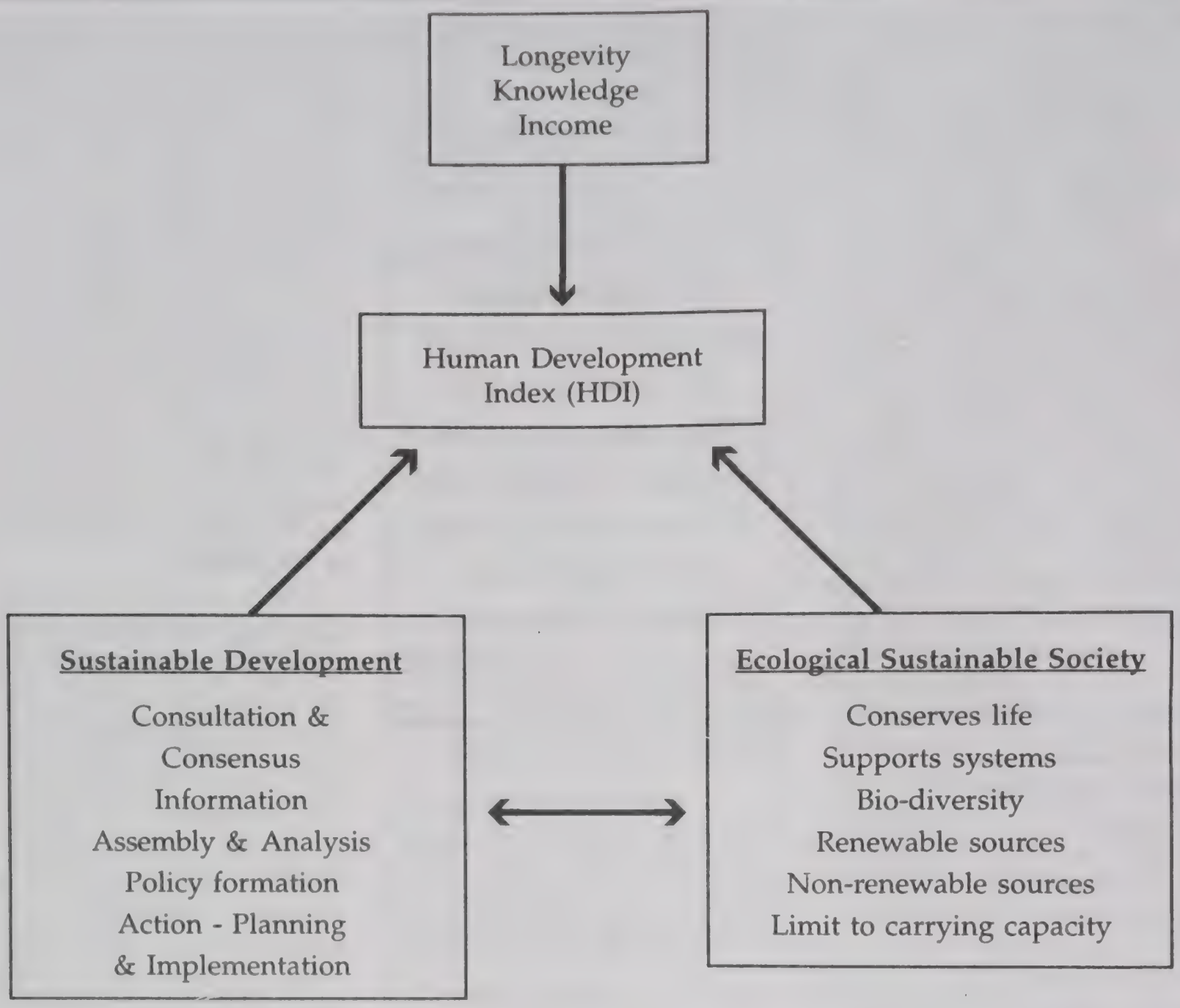

Fig. 1 : Interactions of Human Development Index

position. Steps to increasee national efforts in saving and sharing water in rainfed areas are thus an inevitable need. Efficient water management is needed for water harvesting in rainfall and non-farm water use.

Potential for Farm Employment

Indian farmers, though a vast majority, are literate, are quite perceptive to the changed agricultural scenario. They are better organized, united, sensitive, politcally conscious, often, volatile and sometimes militant. Often they are not exposed to correct or complete information. The recent reaction of Karnataka farmers in ransacking the Cargill seed Company of USA is based on the belief of Dunkel draft being unfavourable to agricultural pursuits. The less privileged farmer with very small uneconomical land holdings with negligible resources to invest in land suffer the most and they form the large chunk of farming population.

Producing more food and agricultural products from less land water and energy needs acombination of innovative modern technique with ecological necessities and traditional experience of farmers. In spite of significant industrali-zation, India has to depend primarily on the farm sector for providing maximal jobs. An estimated 100 million jobs are to be found by the turn of the century, which means a growth in employment of 4 percent annually in contrast to about 2 percent now. Out of this 4 percent growth rate, nearly 3 percent may have to come from crop, animal husbandry, fisheries, forestry and agro-based industries. To quote the eminent scientist, Dr. M. S. Swami-nathan, "this kind of problem of employment generation is not faced in industra-lized nations and it requires economic efficiency and ecological sustainability. Employment generation becomes an important consideration in technology development and dissemination". Are we prepared to face these stark realities to make a strong India ?

FEATURE ARTICLES

Biscuit Packing

A Case Study of Quality Improvement Through Transformation of Industrial Work Culture

Clean Room ISO Standards and Their Implications for Indian Food Industry

HACCP Concepts in Relation to Animal Food Industry

Role of Microoganisms in Traditional Fermented Foods

N-nitrosamines: As Contaminants in Dairy Products

A Case Study Of Quality Improvement Through Transformation of Industrial Work Culture

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Abstract

Demand for Biscuit and Confectionery products of the Industry is often more than what can be manufactured. Therefore, additional product requirement is manufactured by small scale industries on job work basis.

Quality improvements were brought through ***networking*** *among these units by personnel of different hierarchies. This helped to build* ***Team Spirit*** *and* ***Sharing*** *experience of* ***learnings*** *for improvement. A formal system was introduced for quality measurement, periodic quality audit, job rotation, proper communication and participative culture. One of the biscuit factories has obtained* ***ISO 9002 Certification.*** *The overall quality of biscuit improved by 25%, whereas that of hard boiled confectionery by 16% over a period of 18 months with the above quality intervention. Besides, the percentage of process reconditioning reduced by half leading to improvement of productivity.*

Introduction

The earlier work culture of production orientation has shifted to consumer orientation, leading to improvement in quality and overall working environment in India. The cost of advertising and promotion of the products is ever increasing, almost doubling every 2 years. This has resulted in hardship of normal survival for small manufacturers. In the recent past, there has been mutual alliances between a small manufacturer and a big industry by way of getting products manufactured on a Job Work basis. Under this system, the job worker or **contract manufacturers (CM)** produce goods with the technical know-how and overall guidance of big house.

A culture is the set of values, behaviour and norms, which tell people what to do, how to do and what is acceptable.

This article describes the problems and prospects of such mutual alliance, which calls for a lot of transformation of work culture for both employee and owner of the small industry.

Work Culture

A culture is the set of values, behaviour and norms, which tell people what to do, how to do and what is acceptable. Table - 1 summarises the old and new working styles of the owners of small scale industries, who are engaged in Contract Manufacturing of biscuit and confectionery products. Basic transformational changes relate to -

(i) Individualist approach to empowerment of employees.

(ii) Development of managerial skills of self and others.

(iii) Appreciating the crucial role of supplier as important quality link and

(iv) Focus on quality and customer satisfaction.

At times, ego of the owners becomes an obstacle for bringing about these transformational cultural changes. Earlier, a proprietor verbal accounting was enough, but now all accounting has to be recorded and accounted for. These owners have high degree of entrepreneurial skills, but lacked managerial and problem solving skills. The transformation of work culture is a slow process, requiring hard work with a lot of patience for meaningful results.

End Results

The real end results by way of improvement in quality of product, process, people and services will be perceptible when all above 3 basic factors are strong. These act like 3 legs of a teapoy, which will stand sturdy and stable, when all legs have almost equal strength. The details of various activities pursued

Table 1. Need of Change of Working Styles

Sr. No	Characteristic	Old Paradigm	New Paradigm
1.	Management	a) Individualism due to proprietary nature of business	a) Inter-dependence because of adherence to rules and procedures
		b) Accept behavioral and process problems as inevitable and make provision for the same.	b) Development of problem solving skills of self and employees.
2.	Manufacturing protocol	a) Keep production going and deal with any abnormal situation through inspection and reconditioning.	a) Quality goods to be manufactured to meet customer's expectation with minimum waste generation.
		b) One shift production.	b) Round the clock production.
		c) Quality is the sole responsibility of Quality Control Department.	c) All others also have important role to play.
3.	Suppliers	Nil or little contribution for quality improvement	Supplier's involvement and interfacing with respect to timely quality feedback and corrective actions are essential.
4.	Control	a) One man control on everything.	a) Empowerment of individuals and group.
		b) Mostly self supervision	b) Leading the employees for seeking their involvement.

for achieving quality improvements are summarised in Table 2. The quality improvement philosophy of a bigger manufacturing company was based on the following 3 major factors as follows:

Continuous Process Improvement

Deployment of high technology alone is not enough for production of quality goods. Emphasis on continuous improvement of process is very important. This is possible with the participation and training of all employees. Sharing of success stories is a powerful tool of motivating others for reaching to higher goals of improvement. Similarly, job rotation at all levels and encouragement of inter-factory visits with a friendly atmosphere helps in continuous improvement of process.

Deployment of high technology alone is not enough for production of quality goods. Emphasis on continuous improvement of process is very important.

Total Quality Control

The nineteenth century philosophy of self inspection by craftsman has been found to create not only a sense of self pride but improved quality of work and life style. In this connection, daily evaluation of last day's production by operators themselves is a good quality measurement for improvement. Regular quality audit, business reviews and interface with supplier helps for timely corrective action.

Employee Participation

Tremendous improvement in the quality of product or services can be achieved by creating a sense of belonging to the company

Table 2. Basics of Quality Improvements

1. CONTINUOUS PROCESS IMPROVEMENT

A. NETWORKING AMONG COMPANIES

i) QIT : Quality Improvement Team is formed among 3-5 manufacturing units for solving floor problems.

ii) Bench Marking : A monthly system of numerical quality evaluation of 13 biscuits and 5 confectionery units is conducted with respect to consumer satisfaction parameters which generate healthy competitive environment for improvement.

iii) Factory Visits : Opportunity to talk to counter parts of other factories helps to get clarity and confidence.

B. TRAINING AND DEVELOPMENT

i) Technical Officers are encouraged to work in different manufacturing locations for one month in a year as part of job rotation for skill upgradation.

ii) About 15-20% of the workforce is aimed to be trained in more than one skill as a part of multi-skilling.

C. LEARNING THROUGH SHARING

Formal training programmes are held where Owners/Partners of different factories assemble and narrate their achievements in quality and other operational areas.

D. TOTAL QUALITY CONTROL

1. **Daily Evaluation :** A numerical quality index has been developed for daily self assessment of quality parameters by operators themselves for timely corrective action.

2. **Quality Audit :**

a) A quarterly corporate quality audit of each manufacturing location.

b) Occasional friendly quality audit by another manufacturing personnel.

c) A bimonthly quality review is done with major raw and packing material suppliers. Each consignment comes with test report of suppliers.

3. **Business Review :** Half yearly business review of all manufacturers is being held where the techno-commercial matters are discussed. Feedback on market complaints and major thrust areas is highlighted.

E. EMPLOYEE PARTICIPATION

1. **Cultural Programme :** Various cultural and sports activities are encouraged to promote comradeship among the family members of the employees and owners, family- like working atmosphere.

2. **Meeetings :**

i) Weekly meetings with representatives (4-6) of each department by rotation are conducted to cover all 4 main departments of the factory during the month.

ii) Weekly meeting s with all supervisors.

iii) Weekly management meetings.

3. **Quality Circles :** About 5-10% of the workforce have already formed Quality Circle Group activities. This needs a lot of encouragement by top management for proper nurturing of the activity across the company.

4. **News Letters :** Quarterly News Letter is published. This creates a good sense of belonging of the workforce to the factory.

5. **Appreciation :**

a) Yearly trophies are given to the best factory based on quality, productivity, administrative efficiency and such other norms.

b) Certificates of appreciation are issued occasionally as and when a specific and noteworthy improvement is achieved in a particular factory.

through participation of employees. In this connection, cultural programmes, regular meetings, quality circle activities, publication of News Letter, etc., have been found to be effective means of involving the employees for improved results. Under this new paradigm, meaning of work to the employees changes from considering it as a burden to the opportunity for realisation of their potential in life. This changed attitude of employees helps to develop mutual trust to do the right things and expand their capacities, as they are given increased responsibilities.

Tremendous improvement in the quality of product or services can be achieved by creating a sense of belonging to the company through participation of employees.

ISO 9000

With a view to improve the overall system of working as a part of quality philosophy, one Contract Manufacturer has already been certified with ISO 9002 certification by BVQI. This is the first such quality certification for biscuit industry in India. Currently, few more units are preparing themselves for getting such quality certification.

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Clean Room ISO Standards and Their Implications for Indian Food Industry

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Presence of air-borne particulate matter and residing microflora contaminates the FOOD product in processing plants. To assure a good quality end product, high level cleanliness of plant is essential. It is the responsibility of clean room management engineer to create and maintain the desired level of cleanliness. At present, Fed-Std 209E specifies the level of air cleanliness. By the end of the year 1999, ISO/TC 209 standard is likely to be formed for specifying cleanliness of air. For global market competition, any processing product will need to meet ISO standards. Compared to Fed-Std 209E, the proposed ISO standards are more precise. To meet the precised air cleanliness standard, processing plant people have to put more efforts and train their personnel accordingly.

Introduction

Processed Food industry is shaping up at a very fast pace in India. The microbiological quality of the processed foods needs to be assured to the consumer, especially in fruit and vegetable processing, dairy, poultry, meat, seafoods and canned food industries. These products are often unable to meet the prescribed microbiological standards and requirements due to various reasons like poor quality of raw material, inadequate processing, post-process contamination through environmental sources like air and water. Air harbours several types of microflora. Many of them usually confine to floating dust as well as dirt particles and also to aerosols generated by various food processing activites. Apart from a number of molds, few yeasts and certain bacterial genera viz., sporeformers *(Bacillus, Clostridium)*, Micrococci, Aeromonas, Corynebacterium and enterococci are predominant. In general, the predominant types of organisms in air and dust would be those that are existing in particular "environment" and these are also constantly receded to the environment.

The microbiological quality of the processed foods needs to be assured to the consumer, especially in fruit and vegetable processing, dairy, poultry, meat, seafoods and canned food industries.

Now all over the world, the "clean environment" consciousness has increased. The Indian food industry has to adopt very quickly the "clean and environment" concept with ISO standards. Along with removal of dust and dirt particles, it will also help in improving the microbiological quality of the processed foods. This, in turn, will improve (i) the shelf-life of the product and (ii) lower the incidences of food toxicity, infection/intoxication. The advantages shall be of long term perspective both for domestic as well as international trade.

Carl (1996) has stated that specifying an air handling system for clean room applications is one of the most complex decisions for any clean room management engineer. In addition to the traditional cost and maintenance issues, the very strict operational parameters in processing sections are to be considered for clean end products. The increase in capital cost for well designed equipment, construction of building and supply of quality air can be justified by the long term benefits. Along with qualities of air, requirement of other parameteers such as temperature of air, humidity of air, lower vibration of the equipment etc., are also to be fulfilled. Experienced professional air handling unit manufacturers and the end users can help the consulting engineer by supplying such details that nothing can be missed. It is desired to have feed back from the professional and experienced people as early as possible during the design stage.

Reply to the questions who, what, why, where and when for contamination control are the main efforts to have cost benefits for clean environment. For an efficient management engineer, the first requirement for contamination control effort is to create an atmosphere of trust, team work and common goals by working with and involving the

subordinates to gather information for improving the existing system or a new system to be developed within less time. It is obvious that the management engineer is responsible for improving the equipment or process to set up an overall contamination control program with many product lines. The efforts are to be put for best utilization of the resources.

Harold (1996) has suggested the following steps to be considered by the management engineer to work out the requirement for clean room.

(i) Estimate the cost related improvements that can be expected for funding individual action items. This is not to excuse the clients but show them how to increase their return on investment by improving the company's contamination control effort, (ii) Pinpoint who will be responsible for implementing and following up on various improvements, (iii) Whenever possible, enlist the designated responsible party to help, (iv) Explain the action plan that how it will implemented and tackled. However, there should be flexible attitude and possibility to modify the approach, based on other's experience and (v) Emphasize that successful contamination control is not a "one time fix", but must involve a change in style and become an integral way. It requires continual reassessment and willingness to try a new approach for success in the long run.

Clean Room Standards

Shah, *et al.*, (1994) have indicated the present level of clean room standards. However, with increase in demand for better end products, the clean room standards requirement has been raised. Different countries in the world are interested to have common standards to check the quality of clean specialized environments. Richard (1996) has observed that currently, 33 countries are active in the International organization to decide the Codex standards ISO/TC 209 for "Clean rooms and Associated Controlled Environments". These include the voting countries ("P" nations) viz., Australia, Belgium, China, Denmark, Finland, France, Germany, Italy, Jamaica, Japan, Korea, Netherlands, Norway, Russia, Sweden, Switzerland, United Kingdom and United States. Other nations (non-voting members) are : Bulgaria, Canada, Czech Republic, Egypt, India, Ireland, Malaysia, New-Zealand, Poland,Saudi Arabia, South Africa, Thailand, Turkey, Ukraine and Yugoslavia.

The Indian food industry has to adopt very quickly the "clean and environment" concept with ISO standards.

The members of ISO/TC 209 committee have met several times in last three years and they will be meeting again and again. The group has created several working groups to look after various parameters such as classes of air cleanliness; Biocontamination; meteorology and testing methods; design and construction; cleanroom operations; terms, definitions and units as well as mini-environments and isolators. Each working group is supported by a committee of several experts for national standards. The dead line set for completion of clean room standards is 1999. Therefore, the clean, room industry will be in a position to start the next century with global clean room standards in place ISO/TC 209. For a specific class of clean air, the proposed airborne particulate number of different sizes per cubic meter of air is given in Table 1.

Table 1. Proposed Airborne Particulate Number of Different Sizes

Class	Number of Particles Per Cubic Meter by Micrometer Size					
	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1 µm	5 µm
ISO-1	10	2				
ISO-2	100	24	10	4		
ISO-3	1000	237	102	35	8	
ISO-4	10000	2370	1020	352	83	
ISO-5	100000	23700	10200	3520	832	29
ISO-6	1000000	237000	102000	35200	8320	293
ISO-7				352000	83200	2930
ISO-8				3520000	832000	29300
ISO-9				35200000	8320000	293000

Table 2. Comparison Between ISO/TC 209 and Fed/Std 209E

	ISO/TC 209		Fed/Std-209E
No.	Number of particulates	Class	Number of particulates
1.			
2.	4		
3.	35	1	35.3
4.	352	10	353
5.	3520	100	3530
6.	35200	1000	35300
7.	352000	10000	353000
8.	3520000	100000	3530000
9.	35200000	1000000	35300000

The committee of ISO/TC 209 clearly assigned the following specific parameteers as to what the committee would and would not do (Richard, 1996)

Do's....

- Criteria for clean rooms and related environments were to be standardized. They must be measurable and verifiable.
- Trade barriers were to be estimated.
- Voting was by consensus.

ISO standards would be non-mandatory.

Do Not's....

- Clean rooms would not be defined by users specific applications.
- Clean rooms would not be defined by microbial limits.
- No standards would be laid down that might cause a major economic impact on a specific nation.

The new ISO/TC 209 will be more precise as compared to today's Fed-Std 209 E. Richard (1996) has compared the upper limit of 0.5 µm size air borne particulate per cubic meter between ISO/TC 209 and Fed Std - 209 E, which is shown in Table 2.

In order to meet the precised cleanliness requirement as proposed by ISO/TC-209 for global market competition, one is required to take care at every step of processing schedule.

Clean Room Training

In order to meet the precised cleanliness requirement as proposed by ISO/TC-209 for global market competition, one is required to take care at every step of processing schedule. They are required to use the sophisticated clean room maintenance devices to maintain the higher level of cleanliness as discussed by Shah, *et.al* (1995). New employees, who have never set foot in a clean room and the existing employees require training as to how to work in clean environment.

Lisa (1996b) has reported that there is no need to send the person to a class room to impart training to work in clean room or controlled environment. A person can be trained through the other options which have come in the market viz., video, manuals, computer software, tutorials at technical conferences, or in-house orientation. The latest trend is towards a combination curriculum using both video and instructors in-house. Number of companies have come up with such systems to train the personnel. Video has become a popular training tool because it can be repeated whenever persons need a refresher course. It is portable and easy to use. Lisa (1996b) has also reportd that nowa-days video training cassettes covering the different parameters such as clean room design, air filtration, room characterization, contamination, garments, conduct by a personnel in a clean room, items allowed in a clean room, techniques and products for cleaning, what's and why's of clean rooms, cleaning of and within a clean room etc., are avail-

able. John and John (1996) have discussed the automatic material handling in clean rooms.

Conclusion

Currently to compete in global market with "clean quality food products", sterilization of certain food commodities is not only the rquirement, but is also, must to carry out different process, to manufacture such product under contamination free and controlled environment. ISO 9000 standard offers guide lines for building and maintaining a clean room, but none of these regulations state what products or processes require this type of environment. Lisa (1996a) has stated that clean room processes reduce the cost of production for the clean end products by reducing the product spoilage. To create and maintain clean room environment, proper management and staff personnel training is a must. It is high time that the processed food industry also has to pay more attention in this regard.

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HACCP Concepts in Relation to Animal Food Industry

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Meat Foods and Industry

Animal foods are those which are obtained either directly or indirectly from animals. Meat, poultry, eggs, fish and milk are of direct animal origin, while cheese and butter are secondary products. They are richly nutritious and palatable. The meat industry particularly in India as it refers to muscle foods is not a large one and is also not an organised one. Domestic trade is limited to the freshly slaughtered meat sold out of small butcheries. 'Meat packing' as such is not practised. Long distance trade, in fresh and frozen meats is only nominal, as is the international trade where the exports are confined to the Gulf countries. Export potential of sea foods particularly shrimp is very high and current efforts of increasing this trade are evident from the numerous aquaculture farms, which have sprung along the eastern coastal and inland regions. The poultry industry including broilers, layers and eggs has marked its presence by the increased availability of fresh meat and eggs. The processed meat foods industry is limited to canned meat, sausages, ham, bacon etc. The widely organised dairy industry is a success story, which other sectors are trying to emulate.

Meat Borne Disease and Role of Microorganisms

These foods of animal orgin present the risk of transmission of zoonotic and human diseases. International statistics reveal that meat, poultry and fish cause the major fraction of food borne disease outbreaks and that bacterial agents of animal origin are more often implicated than those of plant origin. Whether these foods are to be produced in fresh, frozen or in any other processed and packaged form, prevention of microbial contamination is the most important consideration. It would do the Indian industry well to recognise this and take adequate steps to counter the disastrous effects, which the contaminated/poor quality products will have on the gross national product (GNP). From studies in USA and England by Bryan (1978) and Roberts (1982) respectively, factors which cause foodborne disease outbreaks fall into six major areas;

The meat industry particularly in India as it refers to muscle foods is not a large one and is also not an organised one.

* contaminated raw food or ingredients
* Temperature abuse
* Time temperature abuse
* Insanitation
* Cross contamination
* Improper food handling or employee hygiene.

Control of these factors is essential for safe preparation and processing of food. They are often interrelated and a loss of control of one factor may cancel out the control of the others. Microbial effects on muscle foods depend on two aspects initially. These are the types and their numbers emanating from the six factors listed. There are spoilage causing microorganisms like *Clostridia, Bacillus, Pseudomonas, Aci-netobacter, Moraxella* and pathogenic organisms such as *Clostridium botulinum, C. perfringens, Staphylococcus aureus, Salmonella, Campylobacter, Yersinia* and certain other viruses. The question often is as to whether the race will be won by the spoilage types or the pathogens?

In the fresh raw muscle foods, the natural spoilage microflora is still intact, which should outcompete the pathogens by producing either offensive odours in aerobic packaging or acid that will in-

* *Head*

hibit pathogens in vacuum packaging. Fresh raw meats are also handled as being more sensitive to spoilage and they are cooked before consumption. If cooking regulations are followed, non-sporing pathogens should be absent from the cooked product provided post-process contamination is avoided.

Safety and Quality in Food Production : How ?

The quality requirements used to be vague but insisted upon. These are mandatory but without clear guidelines as to how to achieve such status. How to produce a safe, acceptable animal food product from start to finish, every time, each time ? The Total Quality Management wisdom, its principles and its application encompass approaches for organising, achieving and maintaining quality consciousness and quality assurance.

HACCP simplifies public health protection by identifying the most essential (critical) control points and providing meaningful ways to monitor them.

After much research into the ways and means of this objectives, the concept of Preventive Quality Assurance for meat and meat products and many other foods has been adopted as a rational and systematic approach to prevention based on (1) consideration of hazards i.e., microorganisms or their toxins and (2) identification of the most effective means of controlling these hazards. It originated from the Hazard Analysis Critical Control Point (HACCP) approach, which was developed by the Pillsbury Co., (USA) in 1965 to produce safe and acceptable quality foods for the NASA's manned Space Programme. It was first presented at the National Conference on Food Protection (USA) in 1971 and then developed further for use in food processing establishments.

The HACCP is a procedural tool for both the management and the shop floor and is written up as a document. This assesses the flow of food through the establishment and following needed changes, provides a mechanism to frequently monitor these operations. It is implemented by the industry and monitored by both the in-house management and the regulatory agencies. An HACCP programme differentiates between items of public health concern and those of aesthetic concern. It provides management with tools and monitoring points. It should not be viewed as complicating food service operations or regulations. HACCP simplifies public health protection by identifying the most essential (critical) control points and providing meaningful ways to monitor them. This makes the management's job easy and the regulator's job simpler The steps in applying HACCP are as follows:

HACCP Steps

Identify hazards	Microbes/Toxins
Understand risks	Ranking (Severity and Frequency)
Identify CCP	Places where control must be exercised
Select control point	Effectiveness
Select monitoring options	Utility, reliability, accuracy
Exercise control	Implement QA programme

Risk Assessment by Identification of Hazard

This needs microbiological knowledge and information coming from epidemiological data, and from a commercial type product, which has been in the market for some time or a new product or technology information. It is importnt to consider the source of microbial hazard, raw materials microbiology, organisms, which are introduced during handling/processing,

A critical control point can be defined as a location, practice, a processing step or procedure where control must be and can be exercised to present one or more hazards identified.

the effect of handling/processing on their growth, survival or death, or ability to contaminate at different stages of processing. The foodstuffs are then categorised into Hazard Categories, based on the risk assessment. Usually ingredients but also finished foods can be classified.

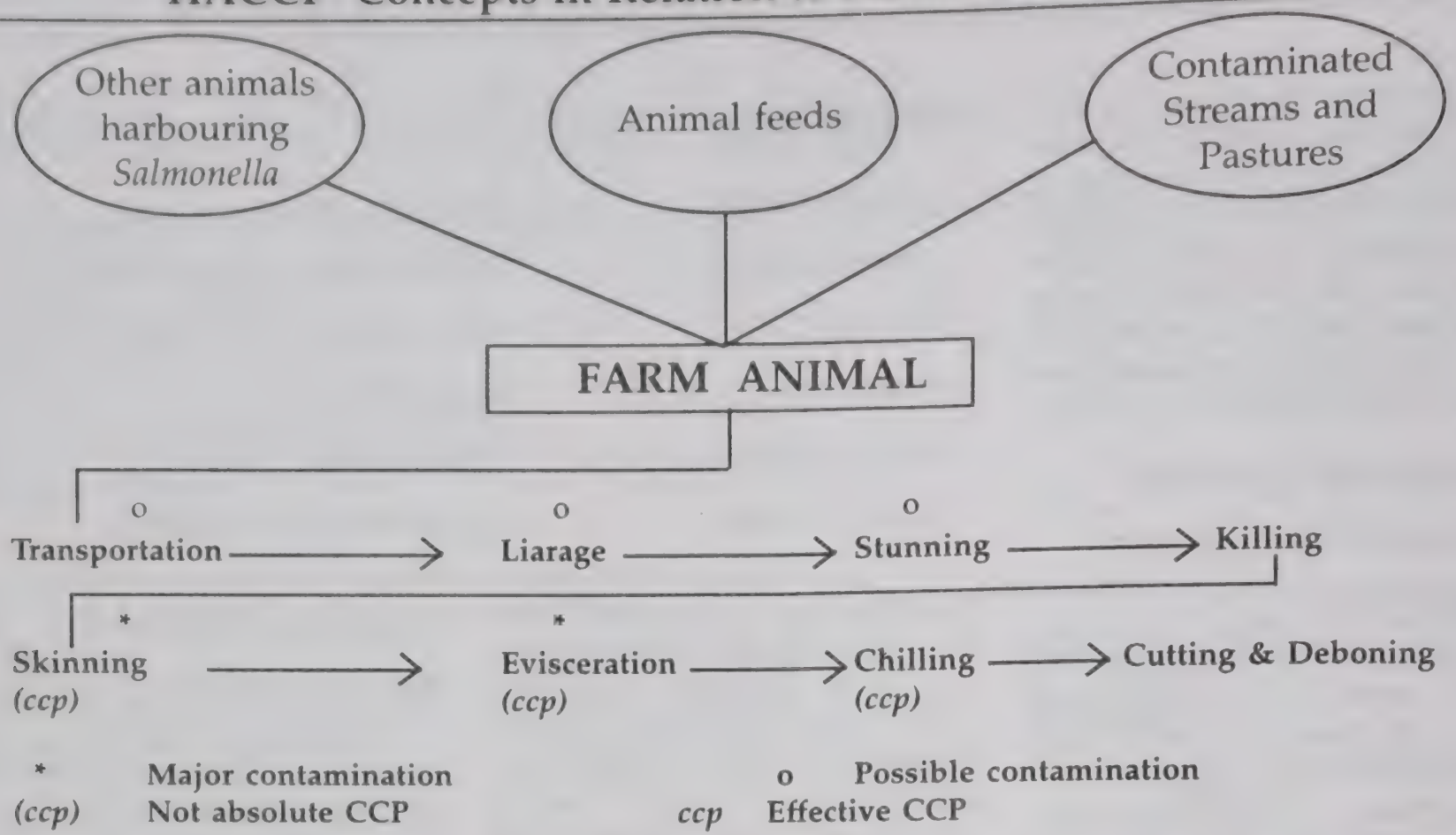

Fig. 1. Quality control in meat production

In a meat industry, HACCP will consist of assessment of hazards associated with raising the animals, their transport, slaughter, processing, distribution, marketing, handling in retail outlets, restaurants and homes (HA) determination of points, which are to be specially controlled and which are critical for containing/restricting the hazard (CCP).

Critical Control Points

A critical control point can be defined as a location, practice, a processing step or procedure where control must be and can be exercised to present one or more hazards identified. A "CCP" is where it can be most effectively exercised (ICMSF 1986). In sterilisation of a shelf stable canned ham, a single operation i.e., heat treatment will eliminate all hazards and therefore, it is clearly an important CCP. But further down the line, recontamination could occur. So, container integrity and post-thermal process hygiene are also CCPs. The severity of hazard and the likely frequency of risk both determine the degree of concern. Therefore, CCPs should be ranked in terms of overall concern in relation to the severity of hazard to be controlled. If more than one hazard needs to be controlled, the control would normally be directed to the most important one.

The prevention of microbial contamination in the antemortem phase of the meat processing is being attempted in Denmark by the elimination of pathogens from meat and poultry through raising Specific Pathogen Free (SPF) herds.

Team Approach

Quality assurance requires a team approach with the microbiologist knowledgeable in the operations, a process engineer with detailed knowledge of the process, a hygiene specialist, plant design and operating practices.

The first task of the team is to draw a flow diagram (Fig.1) covering all the steps of the operation.

Monitoring

It is to ensure that a processing or handling at an established CP is properly carried out and is under control. It could be a systematic observation, measurement and recording of significant factors for control. There are 5 main types of monitoring. (1) Visual observation (2) Sensory evaluation (3) Physical evaluation (4) Chemical measurement and (5) Microbiological examination. Many rapid techniques of measurement could be incorporated here.

HAZOPS

A most effective approach to structured HA is to use a procedure called HAZOPS i.e., Hazard Analysis and Operatability Studies. This is quantitative and searching approach to safety originally introduce by the chemical industry for process safety evaluation for hazards like fire, explosion, toxic gas materials. (Knowlton and Shipley 1977; Lawley 1976).

SPF Concept

The prevention of microbial contamination in the antemortem phase of the meat processing is being attempted in Denmark by the elimination of Pathogens from meat and poultry through raising Specific Pathogen Free (SPF) herds. This is done to reduce reservoirs of diseases transmissible to man and to produce livestock more economically. In case of pigs, 2 levels of SPF herds are attempted: 'red' herds to supply piglets for breeding and 'blue' herds to supply market pork. *Campylobacter* SPF and *Salmonella* SPF herds have been advocated by WHO. This will involve specific organism-free parent material, animal feeds and sites that can be isolated hygienically from the environment. How important the HACCP and the SPF concepts in regard to naimal feeds are, can be illustrated with the recent disastrous ' Mad Cow' syndrome in England, which affected their beef industry. Contaminated feeds carried the virus causing spongiform encephalopathy in cattle. The virus lodges in the brains and affects the animals.

Nurmi Concept

The Nurmi Concept arose from recognising that newly hatched chicks or turkey reared commercially are very susceptible to intestinal colonisation by food poisoning *Salmonellae*, but can be protected from infection by the early establishment of a mature gut flora. Numerous laboratory trials in Scandinavian countries conducted by Rantala and Nurmi *(1973)* the Finnish Scientists, Nurmi, 1985, confirmed that oral administration of gut content suspensions or cultures from adult *Salmonella*-free donors will protect young birds against a challenge of 106, cells of *Salmonella* and markedly reduce both the incidence of carriers and the number of *Salmonella* being shed.

Both the SPF and Nurmi Concepts begin at the antemortem stage of the Preventive Quality Assurance approach. The two concepts along with the basic HACCP can integrate well into any quality control programme designed to produce a safe meat product embodying the 'near zero defects' spirit.

HACCP requires proper documentation, education and training, inspection of facilities and operations and productivity oriented systems available to the industry in general. Above all, the attitude of the management, the cooperation of the workers and the cost effectiviness of HACCP in a food chain will determine the success and acceptance of this or any quality into the severely and globally competitive food industry scene in international trading.

HACCP requires proper documentation, education and training, inspection of facilities and operations and productivity oriented systems available to the industry in general.

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Role of Microorganisms in Traditional Fermented Foods

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Introduction

Use of microorganisms in preparing foods from locally available plant and animal materials is a traditional practice since pre-historic times. Development of "Spontaneous" food fermentation was primarily governed by climatic conditions, the availability of typical raw materials, socio-cultural ethos and ethnical preferences. Fermented foods are defined as foods that have been subjected to the action of selected microorganisms by which a biochemically and organoleptically modified substrate is produced, resulting in an acceptable product for human consumption. Growth and activity of microorganisms play an essential role in biochemical changes in the substrates during fermentation. Traditional fermented foods are generally nutritious and form the basic components of the diet as staple, adjunct, condiment and beverage, providing calories, proteins, vitamins and minerals to the people. With respect to the substrate, traditional fermented foods are generally categorized into products of plant, dairy, meat and fish origin.

Microorganisms associated with traditional fermented foods are present in or on the ingredients and utensils, in the environment, and are selected through adaptation to the substrate and by adjusting the fermentation condition. Three major types of microorganisms are associated with traditional fermented foods and beverages and these are :

- ***Filamentous fungi***

Species of *Aspergillus, Amylomyces, Actinomucor, Monascus, Mucor, Neurospora, Penicillium* and *Rhizopus.*

Fermented foods are defined as foods that have been subjected to the action of selected microorganisms by which a biochemically and organoleptically modified substrate is produced, resulting in an acceptable product for human consumption.

- ***Yeasts***

Species of *Candida, Debaryomyces, Geotrichum, Hansenula, Kluyveromyces, Pichia, Saccharomyces, Saccharomycopsis, Torulopsis* and *Zygosaccharomyces.*

- ***Bacteria***

Species of lactic acid bacteria (LAB)- *Lactobacillus, Lactococcus, Leuconostoc, Enterococcus, Pediococcus, Tetragenococcus* and *Streptococcus,* Species of *Acetobacter, Citrobacter, Klebsiella, Bacillus, Brevibacterium and Propionibacterium.*

Most of the traditional fermented foods are prepared by processes of solid substrate fermentation in which the substrate is allowed to ferment either naturally or by adding starter cultures. The majority of fermented foods and beverages involving filamentous fungi are produced in East and South-East Asia. In Africa, Europe and America, fermented products are prepared exclusively using bacteria or bacteria-yeasts-mixed cultures. Moulds seem to be little or never used (Hesseltine, 1979; Geisen, 1993). In India, mostly due to wide variation in agro-climatic conditions and diverse form of dietary culture of the various ethnical groups, in most cases, three major groups of microorganism are associated with traditional fermented foods and beverages. (Table 1) shows some popular traditional fermented products of India (Ramakrishnan, 1979; Batra, 1986; Soni and Sandhu, 1990; Tamang, 1996). Microorganisms play essential roles and bring about some transformation of the substrates during fermentation.

Biopreservation

Foods may be preserved without refrigeration and without expensive or energy intensive operation by lactic fermentation, which produces lactic acid and sometimes also acetic acid, which lowers the pH of the food and inhibits the growth of other pathogenic organisms (Steinkraus, 1983; Holzapfel *et al.*, 1995). During fermentation of *Gundruk* and *Sinki*, common traditional non-salted fermented vegetable products of Himalaya, spe-

Table 1. Common Traditional Fermented Foods of India

Food	Substrate	Microorganism	Nature and use
Traditional Fermented Products of South India			
Idli	Rice-blackgram	LAB, yeasts	Steamed, spongy cake; breakfast food
Dosa	Rice-blackgram	LAB,. yeasts *B.amyloliquefaciens*	Spongy pan cake, shallow-fried staple food
Ambali	Millet, rice	LAB	Steamed sour cake; staple food
Kanji	Carrot/beet roots	Starter culture used is *TORANI* which contains LAB, yeasts	Strong-flavoured alcoholic beverage
Traditional Fermented Products of North India			
Ballae	Blackgram	LAB, yeasts, *B. subtilis*	Deep-fried patties; snack
Vadai	Blackgram	*LAB*, yeasts B. subtilis	Deep-fried patties; snack
Papad	Blackgram	*LAB*, yeasts	Circular wafers; snack
Wari	Blackgram	*LAB*, yeasts	Ball-like hollow, brittle; condiment
Bhatura	Wheat	LAB	Flat deep-fried, leavened bread; snack
Nan	Wheat	Yeasts, LAB	Leavened flat baked bread; Staple food
Jalebi	Wheat	LAB, yeasts	Crispy, deep-fried, pretzel sweet confectionery
Paneer	Milk	LAB	Soft mild-flavoured cheese; fried, curry
Traditional Fermented Products of Western Regions of India			
Dkokla	Bengalgram	LAB, yeasts	Steamed, spongy cake; snack
Khamam	Bengalgram	LAB	Spongy cake; breakfast food
Rabadi	Wheat/pear-millet/ maize/barley-buttermilk mixture	LAB, *Bacillus* spp.	Cooked paste; staple food
Shrikhand	Milk	LAB	Concentrated sweetened, savoury
Traditional Fermented Products of Eastern Regions of India			
Misti dahi	Milk	LAB,	Thick-gel; sweet savoury
Tari	Date palm	Yeasts, LAB	Sweet cloudy white alcoholic beverage
Traditional Fermented Products of the Himalaya			
Kinema	Soybeans	*Bacillus subtilis, Enterococcus, faecium,* yeasts	Sticky with typical flavour; side-dish curry
Hawaijar	Soybeans	*Bacillus* spp.	-do-; fish substitute
Gundruk	Leafy vegetables	LAB	Sun-dried, sour-acidic taste; soup/pickle
Sinki	Radish tap root	LAB	-do-
Mesu	Bamboo shoot	LAB	Sour-acidic pickle
Jaanr	Finger-millet/rice maize/barley	Starter culture used is *marcha* which contains Filamentous moulds, Yeasts, LAB	Mild alcoholic, slightly sweet-acidic beverage

LAB, lactic acid bacteria mostly spp. of *Lactobacillus, Leuconostoc, Lactococcus, Enterococcus and Pediococcus.*

cies of *Lactobacilllus* and *Pediococcus* produce lactic acid and acetic acid, which lower the pH of the substrates making the products more acidic in nature (Tamang and Sarkar, 1993; Karki, 1994). Due to low pH (3.3.-3.8) and high acid content (1.0-1.3%), *Gundruk* and *Sinki*, after sundrying, can be preserved without refrigeration and addition of any synthetic preservative for more than two years. This can be cited as an example of biopreservation and physical preservation of perishable vegetables, which are plenty in the winter season in the Himalayan regions. Common fermented vegetable products preserved by lactic acid fermentation are *Kimchi* in Korea, *Sauerkraut* in Germany and Switzerland, *Sunki* in Japan etc. Pickled vegetables, cucumbers, radishes, carrots, even some green fruits such as olives, papaya and mango are acid-fermented in presence of salt.

Bioenrichment

Bioenrichment of food substrates by traditional fermentation with proteins, essential amino acids and vitamins enhances nutritive value of the raw material. This has high significance for developing countries, where the majority of the people cannot afford commercially available and expensive fortified nutritive foods. In *Tempe*, a traditional fermented soybean food of Indonesia, the levels of vitamins such as niacin, nicotinamide, riboflavin and pyridoxine are increased by *Rhizopus oligosporus*, whereas cyanocobalamine is synthesized by non-pathogenic strains of *Klebsiella pneumoniae* and *Citrobacter freundii* during fermentation (Leim *et al.* 1977; Keuth and Bisping, 1994). Thiamine and riboflavin contents in *idli*, a traditional fermented black gram-rice breakfast food in South India, has been found increased during fermentation (Rajalakshmi and Vanaja, 1967). Increase in methionine from 10.6 to 60% during *idli* fermentation has been observed (Rao, 1961; Steinkraus *et al.*, 1967). *Pulque*, produced by lactic acid fermentation of juices of the cactus (*Agave* sp.) plant, is one of the oldest traditional fermented beverages of Mexico, which is rich in vitamins such as thiamine, riboflavin, niacin, pantothenic acid, pyridoxine and biotin and serves as important diet of low-income children in Mexico (Steinkraus, 1985). Total amino acids, free amino acids and mineral contents are increased during *Kinema* fermentation. This is a traditional soybean food of the Himalaya, fermented by *Bacillus subtilis* by which the nutritive value of the product is enriched (Tamang, 1995; Nikkuni *et al.*, 1995). *Dawadawa*, *Bacillus*-fermented locust bean food condiment is an important source of riboflavin in the local diet of West Africa (Campbell-Platt, 1980).

Bioenrichment of food substrates by traditional fermentation with proteins, essential amino acids and vitamins enhances nutritive value of the raw material.

In many Asian countries, mixed-culture dough inocula in the form of dry powder or hard balls are widely used as starter cultures to prepare various fermented alcoholic beverages from starchy substrates.

Microorganisms That Produce Enzymes

Microorganisms associated with the fermentation of foods produce desirable amounts of enzymes, which may degrade unsatisfactory or antinutritive compounds and thereby convert the substrates into edible products with enhanced flavour and aroma. *Bacillus subtilis (natto)* produces several enzymes such as proteinase, amylase, mannase, cellulase and catalase during Natto fermentation, a sticky fermented soybean food of Japan. *Bacillus subtilis* KK2:B10 (MTCC 2756) and GK2:B10 (MTCC 2757), isolated from *Kinema*, produce desirable amounts of protease and α-amylase (Tamang and Nikkuni, 1996).

Microorganisms That Destroy Undesirable Components

During *Tempe* fermentation, trypsin inhibitor is inactivated by *Rhizopus oligosporus*. It also eliminates the flatulence causing indigestible oligosaccharides, such as stachyose and verbascose into the absorbable di- and mono-saccharides (Hesseltine, 1983). Microorganisms associated with *Idli* fermentation reduce the phytic acid and content of the substrate (Reddy and Salunkhe, 1980). Bitter varieties of cassava *(Manihot esulenta)* tubers, the main staple crop in West Africa, contain the cyanogenic, glycoside linamarin, which can be detoxified by spp. of *Leuconostoc*, *Lactobacillus* and *Streptococcus* in I *Gari*, a fermented cassava product. Cassava tubers are thereby rendered safe to eat (Westby and Twiddy, 1991).

Enrichment of the Diet

In fermented milk products, lactic acid bacteria produce diacetyl and other desirable flavour (Kosikowski, 1977). Biotransformation of bland vegetable proteins into meat-flavoured amino acids sauces and pastes by mould fermentation is common in Japanese *Miso* and *Shoyu*, Chinese soy-sauce and Indonesian *Tauco* (Steinkraus, 1989). Halopthilic microorganisms contribute flavour and quality to fermented fish products, common in South-East Asia (Itoh *et. al.*, 1993).

During *Tempe* fermentation, mycelium of *R. oligosporus* knits the soybean cotyledons into a compact cake resembling bacon slices. Similarly, in *Ontjom*, an Indonesian fermented peanut presscake product, *Neurospora intermedia* knits the particles into firm cakes, imparting meat-like texture (Steinkraus, 1994).

In *Ang-kak*, a traditional fermented rice food of South-East Asia, *Monascus purpureus* produces a purple-red water-soluble colour in the product, which is used in colouring meats and rice wine (Beuchat, 1978).

Mixed Starter Culture

In many Asian countries, mixed-culture dough inocula in the form of dry powder or hard balls are widely used as starter cultures to prepare various fermented alcoholic beverages from starchy substrates. These starter cultures are known under different names such as Marcha/Bakhar/Phab in India, Nepal, Bhutan and Tibet in China, Ragi in Indonesia, *Nuruk* in Korea, *Bubod* in the Philippines, *Chiu-yueh* in China and *Loogpang* in Thailand. These starter cultures contain mixed microflora of filamentous moulds such as species of *Amylomyces, Mucor, Rhizopus, Actinomucor,* yeasts such as *Saccharomyces fibuligera, Saccharomyces* sp. *Pichia* spp; *Homsemula* spp *and lactic acid bacteria, mostly* spp *of Lactobacillus* and *Pedicoccus* (Hesseltine *et al.,* 1988; Tamang and Sarkar, 1995). These mixed-culture innocula degrade starch into reducing sugars and ethanol with enhanced aroma and flavour to the product (Yokotsuka, 1991). The sweet and sour alcoholic beverages prepared by these starters are *Tape ketan* in Indonesia, *Jaanr/Chiang* in the Himalayan regions of India, Nepal and Bhutan, *Krachae* in Thailand, *Lao-Chao* in China and Taiwan. *Koji,* an amylolytic mycotoxin-free *Aspergillus oryzae* culture on steamed rice is used along with a culture of *Saccharomyces cerevisiae* to prepare the common alcoholic drink *Sake* in Japan (Inoue *et al.,* 1992).

Time has come that we have to commercialize our culturally acceptable traditional fermented foods.

Traditional Fermented Foods of Medicinal Value

Koumiss, a fixy gray acidic-alocoholic beverage is prepared from horse or donkey milk in Russia. It contains *Lactococcus lactis, Lactobacillus bulgaricus* along with some yeasts *Candida kefyr* and *Torulopsis* spp. and has been used in treating pulmonary tuberculosis (Kosiko-wski, 1977). *Kvass,* a rye/wheat-based sour-alcoholic beverage of the Ukraine, is fermented by *Saccharomyces cerevisiae* and *Lactobacillus* spp., and is suggested to provide protection to the digestive tract against cancer (Wood and Hodge, 1985). Consumption of *Natto* presents hemorrhage caused by vitamin K deficiency in infants in Japan. Consumption of *TEMPE* reduces the cholesterol level which is due to inhibition of hydroxymethylglutaryl co-enzyme A reductase, a key enzyme in cholesterol biosynthesis, by oleic acid and linoleic acid during fermentation (Hermosilla *et al.,* 1993).

Conclusion

Most of the traditional fermented foods and beverages of other countries have been well investigated and documented. Statistical data on production, consumption, socio-economy, microbiology, biochemistry, nutritional profile, laboratory scale as well as large scale optimized production methods, etc., of traditional fermented foods of some countries are available. In India, most of the traditional fermented foods and beverages are yet to be investigated. Only a few common fermented foods such as *idli, dosa, dahi* etc., have been studied so far. Isolation, purification and identification of dominant microorganisms involved in traditional fermented foods and beverages are important aspects of such studies. Genotypic identification using molecular methods such as DNA base composition, DNA hybridization and ribosomal RNA sequences and chemotaxonomic tools such as cell wall studies, cellular fatty acids and isoprenoid quinones are helpful, when the conventional approach of identification is not reliable. Due to diverse dietary cultures of the various ethnical groups and wide-variations in agro-climatic conditions of India, microbial diversity associated in lesser-known fermented foods may contribute a significant gene pool, which must not be lost in this generation. The diversity of microorganisms in food ecosystems has not been suffi-

ciently assessed and they may contain undescribed strains, which could be of scientific interest or may have potential industrial application. Time has come that we have to commercialize our culturally acceptable traditional fermented foods, some of which may present unidentified potent gene pools of microorganisms as part of well-known food eco-systems.

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N-nitrosamines : As Contaminants in Dairy Products

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Introduction

N-nitrosamines are secondary metabolites of amines and nitrites having exceptionally high carcinogenic activity. These are of special significance because they may be formed inside stomach after ingestion of nitrites or may directly come through ingestion of food containing it. The common dietary nitrosamines include N-nitrosodimethy1 amine (NDMA) and N-nitrosodiethylamine (NDEA). There are many reports which indicate their presence in different foodstuffs like, meat and meat products, fish and seafoods, cereals and cereal products, alcoholic beverages, soybean oil, mushrooms, vegetables, fruits, coffee, tea, confectionery, poultry and eggs (Table 1). They are also found in cigarette smoke, polluted air, medicines, cosmetics and in packaging materials as condensing component (Fine *et al.*, 1978). In dairy products, they generally occur as contaminants originating from water, residual cleanser, packaging materials, etc. Heeschen and Bluthgen (1990) have reported that high heat treatment given to milk containing nitrosatable moieties leads to the formation of N-nitrosamines in dried milk products. Nitrates from forage, over-fertilized pastures, herbicides, insecticides and biogenic amines, are the common precursors of nitrosamines in milk (Leonhard-Kluz *et al.*, 1978).

N-nitrosamines in Dairy Products

Naturally, N-nitrosamines are not found in raw milk. However, Rubenchik *et al.*,(1988) have reported the presence of NDMA in raw cow's milk at a concentration of 1.6 to 4.1 ppb after oral administration of diet containing 0.26 g nitrate per kg body weight. Similarly, about 3 ppb NDEA in farm milk was detected when silage containing 354 ppb of NDEA fed to milch animals (Mohler and E1-Refai, 1981). Most of the reports indicate that the levels of N-nitrosamines in milk products are in the range of 0.04 to 210 ppb, except some sporadic reports of extreme contamination of nitrosamines in Nigeria and Egyptian region (Table 2)

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Toxicity of N-nitrosamines

About 80 percent of more than 100 N-nitrosamines so far tested are carcinogenic and highly mutagenic. They induce cancer particularly in liver, kidney and lungs. Some of them were found to induce diabetes in the offspring of mice (Stowers and Ewen, 1991) and are also embryopathic and teratogenic (Magee, 1971). The acute LD_{50} for several species of animals ranges from 25 to 41 mg per kg body weight for NDMA and 216 mg per kg body weight for NDEA. The lethality of N-nitrosamines is directly proportional with the degree of methylation of tissue DNA and protein caused by itself. A tolerable dose of N-nitrosamines for humans is in the range of 5 to 10 mg per kg of food, which is recognised as safe. However, the maximum residual levels (MRLs) are not yet established.

Mechanism of Carcinogenesis

N-nitrosamines are thought to induce oncogenesis by methylating

Table 1. N- nitrosamine Contents in Different Food Products

Food and food products	Content in ppb
Meat and fish products	
Cured meat (UK)	1-20.0
Cured meat sausage (Kazakh)	66.0
Cured meat sausage (Egyptian)	14.2
Smoked meat sausage (Estonian)	1-13.0
Cooked bacon (Swedish)	3.3
Fried chicken (Canadian)	0.4
Fish products (Russian)	21.0
Salted fish (Chinese)	39.4
Beverages	
Malt (Polish)	0.2-3.6
Beer (French)	0.2-1.5
Beer (German)	0.5-1.7
Beer (Canadian)	1.5
Beer (New Zealand)	0.2-1.8
Beer (Australian)	0.5
Beer (Japanese)	5.1
Vegetable products (Russian)	1 - 3.0

Table 2. N-nitrosamine Contents in Dairy Products

Dairy product	Content in ppb
Heated milk	2.0
Dahi	9.4
Whole milk powder	3.3
Skim milk powder	1.3-2.2
Infant milk product	0.1-0.8
Egyptian cheese	41300-87300
Dutch cheese (Gouda)	0.1-0.7
Edam, Gouda and Havarti cheese	30-210.0
Edam and Gouda	0.1-168.8
Roquefort and Camembert cheese	0.5-21
Hard cheese	9.4
Milk products (Egyptian)	6500
Milk products (Nigerian)	2000-15000

amino groups at the base moiety of nucleic acid (Benemanskii, 1989), but Ruddon (1990) has reported that N-nitrosamines possibly undergo transformation through hydroxylation reactions (Fig.1) in *vivo,* leading to formation of an active carcinogen, which ultimately may induce tumour formation. The hepatic microsomal cytochrome P450 mono-oxygenase is the key enzyme (cytochrome P450 2E1) responsible for metabolic transformation of N-nitrosamines to its tumour inducing derivatives. This enzyme naturally gets induced by dietary lipids, carbohydrates and ethanol and also during fasting (Yang *et al.,* 1992). However, inhibition of cytochrome P450 enzymes responsible for metabolic activation of N-nitrosamines causes passage of these carcinogens to extrahepatic tissues which further leads to greater clinical complications (Yang *et al.,* 1994).

Mechanism of Nitrosatable Reaction

The principle mode of formation of N-nitrosamines is the reaction between nitrous acid and secondary amines. (Fig.2). They are also formed from tertiary amines, quaternary ammonium compounds and primary amines. Certain amino acids, viz., proline, tryptrophan, tyrosine, cysteine, arginine and histidine (free or protein bound) also act as precursors which undergo chemical conversions to produce N-nitrosamines during the cooking of protein foods (Cheftal *et al.,* 1985). N-nitrosamines are also formed from biogenic amines, viz., histamine, putrescine, tyramine, phenethylamine, etc. at more physiological pH values of 3.0 to 9.0 (Stephany *et al.,* 1978). The kinetics of N-nitrosamine formation follows a third order reaction with pH optimum of 3.4, close to the pKa value of nitrous acid (Mirvish, 1975).

Factors Affecting N-nitrosamines Formation

Through nitrates or nitrites are the possible theoretical precursors of N-nitrosamines, addition of these nitrosatable compounds to milk does not always lead to increase in N-nitrosamine concentration in cheese, which may be due to the unfavourable pH condition in cheese or reduction of nitrite to other products by the reducing action of certain strains of Lactobacilli (Rowland and Grasso, 1975). The amount of nitrate added to milk does not influence the quantity of N-nitrosamine, but rather with the degree of cheese ripeness (Smiechowska *et al.,* 1994). Low pH favours the formation of the unreactive protonated amine, but results in a shift in the equilibrium exhibiting an inverse relationship between amine basicity and N-nitrosamine formation because of possible reaction with amines, which occur naturally in the milk during drying for powder preparation (Przybylowski *et al.,* 1990). Miskiewiez *et al.,* (1988) have reported that nitrate and *E. coli* contaminated milk favours formation of N-nitrosamine during fermentation.

About 80 percent of more than 100 N-nitrosamines so far tested are carcinogenic and highly mutagenic.

The principle mode of formation of N-nitrosamines is the reaction between nitrous acid and secondary amines.

Determination of N-nitrosamines

Determination of N-nitrosamines in food products at the ppb level is time consuming and difficult. Many techniques have been developed based on thin layer chromatography (TLC), U.V. absorption spectroscopy, polari-graphy, gas chromatography, gas chromatographic-thermal energy analysis (TEA), gas chromatographic-mass spectrometry and combined HPLC-TEA (Fine and Rounbehler, 1976). Among these techniques, HPLC-TEA is the method of choice because of its high selectivity and sensitivity upto 0.1 ng to N-nitrosamines.

Inhibition and Decontamination

Synthesis of N-nitrosamines can be reduced by adding inhibitors like ascorbates, erythrobates, vitamin A, tannic acid derivatives, sorbic acid and α-tocopherol (Shenoy and Choughuley, 1989). Chlorogenic acid (150 mg per kg body weight) and premelanoidin (1kg per kg body weight) which are formed during roasting of coffee beans also inhibit nitroso-urea induced DNA damage (Aeschbacher and Jaccaud, 1990). Lipids and lipid containing foods like cow's milk have certain properties to inhibit nitrosation reaction due to the presence of unsaturated fatty acids which readily react with nitrite at

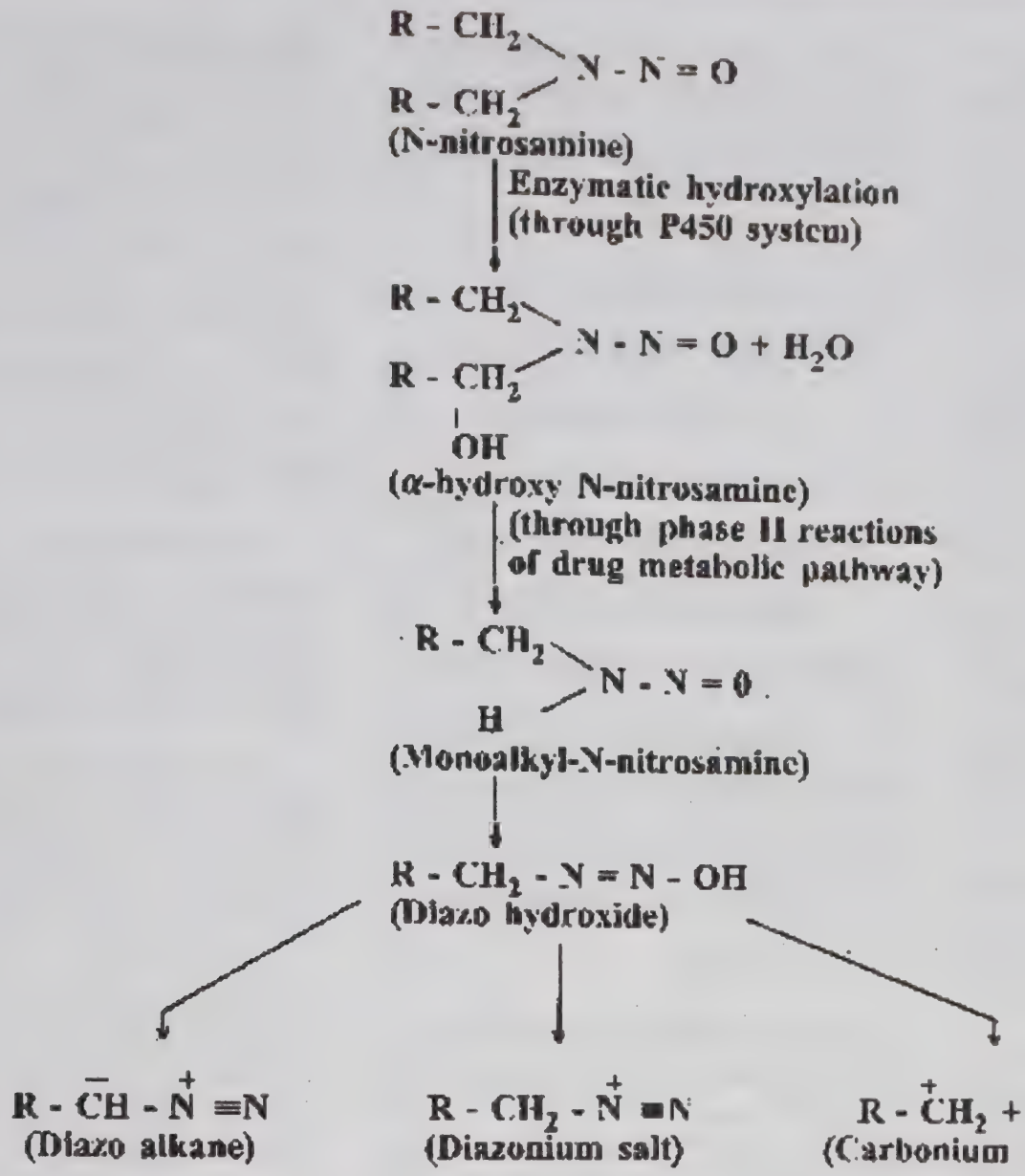
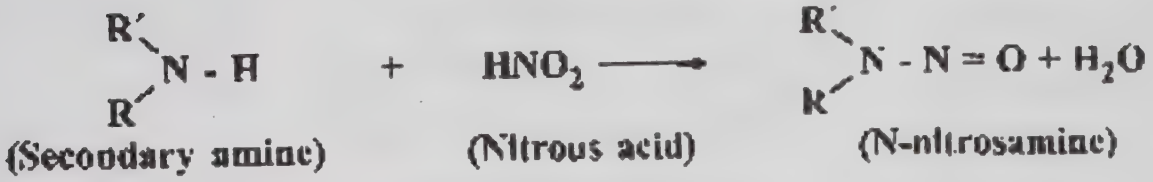


Fig 1. In vivo *transformation of N-nitrosamine to active carcinogenic metabolites through metabolic pathway*



Where, R' → an alkyl group

R → an alkyl, aryl or a wide variety of other functional groups.

Mechanism:

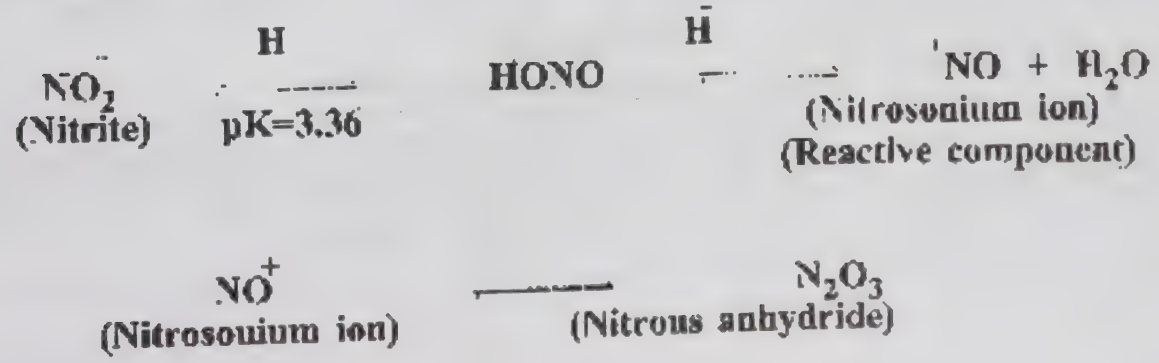


Fig 2. Mechanism of formation of N-nitrosamine

low pH in aqueous system to reduce the available nitrite (Kurechi and Kikugawa, 1979). Milk products containing 0.6 to 3.2 per cent fat (milk, cultured milk, curd, buttermilk and *kefir*) inhibits NDMA formation. In contrary to this, Rooma and Uibu (1983) reported that high fat cream containing about 35 per cent fat stimulated NDMA formation.

N-nitrosamine undergoes denitrosation on heating with mineral acids. These compounds can be oxidized to the corresponding N-nitromine with oxidizing agents like H_2O_2/nitric acid and ammonium per sulphate/nitric acid and can be reduced with Zn dust in acetic acid and lithium aluminium hydride to hydrazines or secondary amines. In dilute acid, they undergo photo reaction generating C-nitrosamine or oxime.

About 60-70 percent of N-nitrosamines can be removed by ultrafiltration of homogenized foods through a UAM-50 cellulose acetate membrane (70 Apore size) and 50-60 percent by ultrafiltration of high fat foods through UAM-300 (280 A pore size), but these processes are cost-intensive. N-nitrosamines can also be enzymatically degraded into diazoalkane or carbonium compound (Wong, 1989). Biodegradation of nitroso compounds by enzymatic activity of a yeast *(Debaryomyces anceris)* has also been reported in cheese milk (Huynh, 1980) However, most of the decontamination reports are of academic interest only and none of them, yet reported are economically feasible for adoption at commercial level. The need of hour is to develop a method which can either scavange N-nitrosamines or their metabolic end products without affecting the activities of metabolic enzymes. And some structurally similar compounds need to be formulated, which in turn, can compete with N-nitrosamines for binding to the metabolic enzymes resulting in the decrease in carcinogenic potency of the N-nitrosamino compounds.

The need of hour is to develop a method which can either scavange N-nitrosamines or their metabolic end products without affecting the activities of metabolic enzymes.

Conclusion

Once milk gets contaminated, there is no practical way of getting rid of the contaminant like N-nitrosamines, which get into milk at the production of processing stage. It is evident from available reports that although the levels of nitrosamines in milk products are not alarming, there is a need of systematic survey covering all parts of the country. The problem of nitrosamines can be overcome only through appropriate technological means, monitoring the processing parameters and extensive efforts against the indiscriminate use of pesticides, fertilizers and insecticides in agriculture.

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Chennai - 600 096

High Pressure Centralised Lubrication Systems

Micro Precision manufacturers high pressure centralised lubrication systems. Marketed under the trade name Oilube D, the unit is capable of delivering oil up to 110 kg/cm2 pressure. Oil delivery of individual pump is adjustable to 0-0.1 cc/strokes. The viscosity of the oils handled can vary from 100 to 1,000 est. The number of pumping units per lubricator can range from 4 to 24. These systems are available with and without gearbox. Standard gear reductions available are 75:1 and 65:1. In case of non-geared version, a sprocket and priming handle are provided on the camshaft. These systems find applications in forging and sugar industries.The company also undertakes design and development of lubrication systems as per the customers, requirements.

For more details write to :

Micro Precision
5-A, Konark Udyog,
Opp SNDT College, Karve Road,
Pune - 411 038

Tank Level Indicator

Modi Electronic and Engineering Co has developed a remote-reading electronic tank level indicator. This instrument is suitable for almost all liquids, including demin water, concentrated acids and alkalis, oil, liquid medicines, syrups and industrial effluents. The sensor is to be top-mounted at the tank. There is no need to empty the tank or stop the process. The indicator can be wall or panel mounted. Distance makes no difference. If the user can bring an ordinary 3 crore cable from the tank to the indicator, he can get a reading. Readings are digital, in meters to 2 decimal and does not depend on liquid properties like resistivity, conductivity, capacitance, weight or viscosity. Since there are no electrodes, there is no question of pitting or corrosion or deposits. Tank depths can be anything from 30 cm shallow trays such as those of cooling towers, to silos and sumps of 15 metres or more. Several systems are available such as indication only, indication plus alarm, indication plus pump control, multi tank systems and multi pump systems.

For more details write to :

Modi Electronics &
Engineering Co.
72, Chikhoii MIDC,
Ambernath - 421 505

Conveyor Belts

HIC International Co. Inc, offers the International conveyor belts for successful materials handling such as cement clinker, coal, iron-ore, limestone, baggase, paper & pulp, rice husk, bauxite, foundry sand, mud and fertiliser. These belts conform to IS 1891 and DIN standards. Special belts such as chevron cleats, side wall cleats, full width cleats and rough top are manufactured to handle bulky material/packed bags at high inclination. The range comprises 250 mm to 1,600 mm widths, 2 to 12 ply, in all cotton/nylon/EP carcass and different cover grades viz., M, N, HR, Super HR, hygienic, in open end lengths or endless to requisite size.

For more details write to :

HIC International Co, Inc,
Anil House, D 136,
Shankar Road,
New Delhi - 110 060

Dryer-Pulveriser

The Hanrez dryer-pulveriser can either pulverise or dry simultaneously in a single operation. It is intended for all products requiring grinding down or pulverising with or without drying. The operations are adjusted to suit the characteristics of the materials, their subsequent uses and the fineness and dryness required. The Hanrez dryer-pulveriser is used particularly in drying operations where pulverising is a secondary consideration : It is also used to pulverise powder or granular products. The finished product's structure can be tailored to the subsequent use (granulation, compaction). The dryer-pulveriser is used in a range of fields such as

chemical industry, food industry, quarries and sludge treatment. The raw product and the hot gases are fed simultaneously into the device, inside which the sludge is broken up and kept in suspension during drying. Unlike in traditional dryers, the sludge is dried in only a few seconds in the dryer and the product is never super-heated as the temperature of the material in suspension remains constantly lower than that of the steam at the dryer-pulveriser outlet. The treated product is collected by an automatic filter bag or by any other approved dust removal device.

For more details write to :

Hanrez SA
Rue de Trazegnies 41,
B-6031, Monceau-sur-Sambre,
Belgium

Digital Timers

Omega Electronics manufactures digital timers to cover ranges of 99,999,9999 milliseconds, seconds and minutes, suitable for applications such as on delay, off delay, unequal cyclic and equal cyclic. Time setting is provided with the help of 2, 3 or 4 digit thumb wheel switches.In case of cyclic timers 2+2 or 3+3 thumbwheel switches are provided. Accuracy is better than 0.05% with crystal controlled time base. Output available is two change over relay contacts rated for 6A resistive load. Supply voltage range is 180 to 275 V AC. These timers are available in panel mounting sizes of 96x96x150 mm with or without digital display. Electech digital timers find applications in plastic processing machines, packaging machines, printing machines, pharmaceutical machines and process control applications.

For more details write to :

Omega Electronics
217 Bombay Talkies Compound,
Shree Ram Maarg
Malad (West), Mumbai - 400 064

Food Centrifuge

Bock Engineered Products Inc, of USA manufactures a range of processing machines including food processing machines. The Bock FP series centrifuges are constructed on the self-balancing design concept and do not require foundation anchorages. With the highest G force available in the industry, the units can go up to 1,700 rpm. Also manufactured are the Tornado automatic drying systems, designed on their patented concept of rapidly rotating conveyors, capable of handling up to 6,000 lbs of product per hour and requiring no manual labour.

For more details write to :

Impetus Incorporated
K-56/4 Annanagar East,
Chennai - 600 102

Six-Channel PID Temperature Controller

The Model SCTC6 is a microcontroller-based PID temperature controller to accept six thermocouple inputs simultaneously and to provide time-proportional PID control outputs, with anti-reset wind-up. It facilitates 12 SSR outputs (heat/cool outputs per channel), with 230 V AC/36 VA rating for individual output. Separate alarm relay output is also provided. Parameters like set point, proportional band; reset time, rate, cycle time, blower point, alarm high/low, input offset and thermocouple selection are programmabe through user-friendly memlbrane keypad. Other features include : software calibration, automatic cold-junction compensation, thermocouple open and reverse detection and indication, use of reliable EEPROM technology for configuration security and modular structure. Application areas include plastics, chemical, textile and food processing industries.

For more details write to :

Streamline Controls
B-213/214, GIDC
Electronics Estate
Gandhinagar - 382 044

Digital pH Meter

PBS offers a simple direct indicating instrument, which measures the pH value of any solution. pH is from 0 to 14 with accuracy ± 0.05 pH and relative repeatability ± 0.02 pH and display being 3-1/2 digit LED (gree) 7 segments (0.5ht). The instrument is designed for mains operation (230 V AC). pH adjustments and calibration can be done with buffer solution of known pH value. pH meter is designed for laboratory as well as industrial purpose (on-line). It is supplied along with electrode, electrode stand and buffer solutions. pH meter has been tested and used by government organisations. PBS also manufacturers digital conductivity meter, temperature controller and electroplating timers.

For more details write to :

PBS Electronics
10 Dattani 5A, Shivaji Road,
Kandivil (West),
Mumbai - 400 067

NEW MACHINERY

Centrifugal Systems for Rapid Liquid-Liquid-Solid Separation

Flottweg, GmbH, Germany, manufacturers systems for use in industries such as chemical, pharmaceutical, food, soap and mineral oil. Its Decanters and Tricanters are useful for two phase and three phase separations. Sedicanters find application in handling thick slurries. Flottweg's disc centrifuges can separate two liquid phases with or without solids. Apart from oil refineries and breweries, other areas of application of these systems are industrial waste water, vegetable oils and fats, fruit juices, proteins, resins, lube oil, diesel, heavy fuels, etc. Flottweg has innovative designs for difficult to centrifuge applications.

For more details write to :

Impetus Incorporated
K 56/4, Sri Krishna Apts,
Annanagar (East)
Chennai - 600 102

Chemical Plants and Process Equipment

Arvind Anticor has developed corrosion resistant plants, equipment and machinery from engineering plastics such as PP, PVC, HDPE, PVDF, ECTF, FRP, etc for chemical process industries. The product range includes storage tanks and vessels, tower, exhaust fan, ducting scrubber, piping, valves and fittings, polypropylene pumps and filter, pollution control equipment etc., Features include : resistance to UV radiation, lightweight, stress resistance, enhanced insulation properties (non-conductive), wear and abrasion resistance, smooth surface, aesthetic look and toughness and rigidity.

For more details write to :

Arvind Anticor Ltd.,
Survey No 563/1,
Phase IV, GIDC, Vatva
Mehmedabad Highway, Opp
Hanuman Temple, Ramwadi,
Ahmedabad, - 382 445

Densification Bagging Machines

Premier Tech, Canada, manufactures bagging systems. Densification bagging is one of its latest innovations in bagging technique. This system is applicable for all fibrous materials or compressible materials. Bags made of polyethylene or even paper can be used in these machines. Bagging can be done with or without gussetting. Horizontal form - fill - seal machines with an output of 28 bags per minute are also manufactured by the company.

For more details write to :

Impetus Incorporated
K 56/4, Sri Krishna Apts,
Annanagar (East)
Chennai - 600 102

Water Purifier

The Rakshak water purifier is a compact model of fibre body for domestic use. It is used on three stage water filter and purification through ultraviolet rays. In the first stage, it clears physical impurities when water passes through the PP candle. In the second, organic filtration takes place as the water passes through the activated carbon and lastly bacteriological purification is done in the ISI304 ultraviolet chamber. Here, water is treated with ultraviolet rays. Finally, one gets purified drinkable water.

For more details write to :

Rakshak Water & Effluent Care
and Marketing (P) Ltd.,
'Vijay', 6, Mohan Nagar, Naviakha,
Indore - 452 001

HPLC Packings for Acidic and Basic Compound Analysis

SGE has introduced in the HPLC market the Wakosil II ™ 5C18 Rs. Consisting of a high performance reverse phase HPLC column, which is ideally suited for acidic and basic compound analysis, this system is a super phase endcapped C18 HPLC packing material based on a high purity spherical silica support. Against a normal phase load w/w : 12% in conventional HPLC columns, the Wakosil II offers a phase load w/w : 17%. With a pH range of 1.4-9.4, the high purity silica used in the system column ensures that the metal content in it is only a fraction of that present in conventional RP columns. This ensures perfectly symmetrical peaks for basic and acidic compounds. This system is also available in glass, lined tubing for true metal free analysis. SGE also supplies Wakosil II in stainless steel for routine HPLC work. The advantages of its column make it the first choice for reversed phase chromatography.

NEW MACHINERY

For more details write to :

SGE Laboratory Accessories
Pvt. Ltd.,
209 Milan Indl Estate,
Abhudaya Nagar,
T J Road,
Mumbai - 400 033

Machine Vision System

The Pi030 Magnum from Performance Imaging Inc., is a self-sustained production vision system on a single board. Designed for real-time machine vision applications, the Pi030 has an integrated host computer, a pipeline array processor to perform all significant image analysis functions by hardware, interfaces with upto 256 digital I/O ports. Up to four cameras of any mode can be interfaced to the system and a separate VGA monitor allows results to be displayed. The system can accurately locate and identify complex patterns amidst different background conditions. A built-in-Ethernet networking facility allows the system to be interfaced to IBM PC or Unix-based workstations for applications software development. Applications include: automatic positioning and alignment, gauging and classification of parts, flaw detection, checking cleanliness of cans and bottles, product packing and sorting, label and date/lot code verification, surface and print quality checking etc.,

For more details write to :

Astra-Tek Instrument
(Bombay) Pvt. Ltd.,
208, Atlas Mill Compound,
Reay Road,
Mumbai - 400 010

High Quality Disposables

PSI manufactures high quality disposables for use in chemical industry, where safety and hygiene are of prime importance. Items include plastic disposable hand gloves, aprons, face masks, caps, shoe covers and gowns. These disposable provide an excellent barrier against infection, corrosion, humidity, gases, allergies, dust, fumes, contamination and are made from the best quality mateiral. PSI also manufactures disposables from imported non-woven fabric, which are air permeable and comfortable to wear and bio-degradable. These disposables eliminate the necessity of maintaining inventory and maintenance costs. The products are used in pharma, chemical, pesticide and food industries, hospital and medical fields.

For more details write to :

PSI Marketing Pvt. Ltd.,
405, Lokmat Bldg,
Wardha Road,
Nagpur - 440 012

Datalogging Spectrophotometer

Hach Company, USA has introduced the DR/2010 data logging spectrophotometer that offers advances in performance and convenience. New capabilities include the ability to store, recall and print up to 1,000 sample readings. The information that can be reported includes program number, parameter, units, concentration, date, time group number, sample number, and absorbance or %T. The recalled data may be sorted by parameter, concentration, date group number or sample number. The group number would be useful in identifying an individual operator or location where testing involves multiple operators, sample sites or facilities. Other advances include a simplified user interface, reduced reagent usage on many procedures, a microprocessor that is eight times faster than existing Hach's DR/2000 spectrophotometer, and the ability to easily upgrade software with a program disk at the user's site. The DR/2010 spectrophotometer is designed for laboratory or field use and operates on either line power or batteries. Hach also offers 12 different DREL portable laboratories, which are equipped with a DR/2010 and the reagents, apparatus, and labware required for specific water quality monitoring applications. The DR/2010 comes with 120 pre-programmed methods, including 18 new Hach methods, and can store up to 50 custom Calibrations. A visual display guides users step by step through a procedure.

For more details write to :

Orbit Technologies Pvt. Ltd.,
404, 4th Floor, Taramandal
Complex, Salfabad
Hyderabad - 500 004

Aramid Fibre Packing

The Flojet-PA is a diagonally woven packing obtained from 100% aramid yarn impregnated with chemically resistant PTFE. This abrasion resistance packing is suitable for heavy slurry applications, sewage, paper mill applications, and high pressure

reciprocating pumps. It can withstand -200°C to 280°C and 8,000 PSI and has a pH value 3-12.

For more details write to :

Flojet Marketing Pvt. Ltd.,
H-201 Ansa Industrial Estate,
Saki Vihar Road,
Mumbai - 400 072

Filter Press

Techno Filters Pvt. Ltd. offers filter press and most innovative indigenous membrane filter elements in polypropylene. The advantages of membrane filter elements are vast compared to conventional plate and frame type elements or recess plates type elements, viz., filtration efficiency is higher, increase in throughput, and final moisture is reduced upto 30%. Due to reduction in moisture content, drying time is less, thus saving drying cost. Filtration-wash and cake discharge cycles are shorter. Consumption of back-wash liquid is less upto 60%. Handling costs are lower due to less cake volume and higher solids concentration. Dry blowing is not required and cake separation from filter cloth is better. The sizes of membrane plates available are 610mm x 610 mm and 1,200 mm x 1,200 mm. The filter press is mostly used in dyes-pigments, bulk drugs, oils, sugars, ceramics, electrolytic metals, effluent treatment, sludge dewatering and allied industries. The skeleton on the filter press can be casted or fabricated as per suitability of process; feeding pressure of slurry and squeezing pressure. As per suitability of process or user's requirement, skeleton is fitted with suitable closing device such as manual closing device or hydraulically operated closing device. The filter press comes in two main types. One is plate and frame type and another is recessed plate type. Either type can be made from cast iron, stainless steel, aluminium or polypropylene depending on the properties of slurry.

For more details write to :

Techno Filters Pvt. Ltd.,
5, Business Plaza,
Opp Hotel Rosewood,
Tulsiwadi Tardeo,
Mumbai - 400 034

Sample Preparation System

Emerge India offers state-of-the-art sample preparation systems from A i Scientific, Australia. The sample preparation system is ideal for one's repetitive sample preparation. It ensures that the analyst's samples are ready for analysis on his ICP, AAS, FIA, GC, HPLC, IC, particle size, spectrophotometer or any other liquid analysers with two important advantages. Firstly, automated sample preparation system eliminates the potential human error inherent in manual preparation. Secondly, it results in enhanced productivity, thereby increasing the productivity of the laboratory. In this era, when quality of analysis is paramount and system validation is important, it necessitates utmost reproduction in sample preparation. No instrument for analysis can give reproducible results, if sample preparation is not up to the mark. The sample preparation system comprises an autosampler, a dispenser, windows-based software and pre-configured sample racks. It does all the work safely and accurately whilst unattended.

For more details write to :

Emerge India
Gulab View, 3rd Floor,
Near Basant Cinema
Chembur, Mumbai - 400 074

Digital Preset Counter

Omega Electronics manufactures a digital preset (batch) counter for counting turns, articles, revolutions, length, 999 (3 digit), 9999 (4 digit) or 99999 (5 digit). Presetting is done by a thumbwheel switch, logic signal micro-switch etc. The instrument is immune to industrial noise and retains its count value in case of power failure. On exceeding the set limit, a relay operates changeover contacts of which are available on the rear panel. It can be wired for self resetting with or without manual delay function. Supply voltage range is 180 to 275 V AC. Also, available are multistage preset counters and batch totalisers. Electech digital preset counter finds applications in plastic processing machines, packaging machines, printing machines, instrumentation and process control panels. It is available in standard DIN and half DIN sizes.

For more details write to :

Omega Electronics
217, Bombay Talkies
Compound,
Shree Ram Marg
Malad (West),
Mumbai - 400 064

NEW MACHINERY

Freeze Drier

Pharmalab offers laboratory freeze-driers (14 versions), manufactured by Amsco/finn Aqua, Germany, which excels as freeze drying technology equipment manufacturer. The pioneers and the world leaders also have a distinction of offering excellent technical and application support. This gives Pharmalab a unique position to lead the way to the latest technology of freeze-drying. Pharmalab has also signed licensing agreement with Amsco for manufacturing freeze-driers in India. The first indigenous five machines are ready duly approved by its principals. Specific features of the driers are : Two chamber design - offer PRM & BTM to determine the end of drying cycles; cycle optimisation; easy cleaning reduces cross contami-nation : PLC operated with recording facilities and effective local spares and after-sale service.

For more details write to :

Pharmalab Engineering
(India) Ltd.,
SMR Compound, LBS Marg,
Vikhroll (West),
Mumbai - 400 083

Laboratory Oven

Kapoor International offers a range of laboratory ovens with heating capacities up to 300°C. With MS/SS interiors, the ovens are fitted with an electronic temperature controller and electrically heated. Besides, there is a provision for air circulation. The ovens are available in different sizes with provision to accomodate several trays. They find applications in food processing, chemical, agricultural and other industries.

For more details write to :

Kapoor International
22/23, Vishnu Indl. Estate,
Masrani Lane,
Halav Pool, Kurla (West),
Mumbai - 400 070

Universal Counter/Timer

M B Control & Systems has introduced a universal counter/timer. This microprocessor-based instrument can be used as counter or timer. All parameters are programmable at site by using the four front panel keys. Features include up/down counting, one or two set points, one or two relay outputs, counter prescaling (up to three decimal points), four/six digits display, power fail data retention, count offset for counter and timer, gate input for counter. Power supply 12 V DC is also available for sensor input. For timing applications, the timer mode provides one milli-second resolution. Various timing modes can be programmed in the instrument. This low power timer/counter can be operated from 110 V or 220 V AC. Power consumption is only 7 VA maximum. The instrument is housed in strong ABS plastic enclosure. Maximum weight is 500g. It is available in 48 x 48 mm or 48 x 96 mm sizes. It is ideally suitable for machinery manufacturers, packaging machines, length measurement, flow measurement and counting applications.

For more details write to :

M B Control & Systems Pvt. Ltd.
31/1, Ahiripukur Road,
Calcutta - 700 019

PVC Belt with Closed Edges for Food and Drug Industries

Prolific offers the Amseal range of belting, from Ammeraal, the Netherlands, The belts have been developed with completely closed edges improved hygiene, reduced maintenance and longer belt life. The increasingly severe hygienic demands of the food and drug industry require that the production line should be visually clean and free from bacterial growth, the belt edges do not fray to prevent fabric particles contaminating the final product, and chemicals and other substances do not enter the belt and affect the product.

For more details write to :

The Prolific
84, Stephen House,
4, BBD Bagh (East),
Calcutta - 700 001

Dry Fruit Cutting Machine

Twinkle Star offers Krishna brand dryfruit cutting machine, which makes slices at 8 to 10 kg/hr. and powder at 10 to 15 kg./hr. from almond, cashewnuts, pista, chestnut, groundnut, black pepper, coriander seeds etc. The light weight machine works on a 0.19 HP single phase electronic motor.

For more details write to :

Twinkle Stars
Arya Sadan, Dayanand Nagar,
Opp Sheth High School,
Rajkot - 360 002

NEW PRODUCTS

Braun-y-Mixer Grinder

The Braun Multiquick from Braun is a high power, high performance mixer-grinder with a 750 W German motor which can perform all tough, heavy duty grinding functions. The razor sharp German stainless steel blades ensure performance to suit the need of any Indian household. The product's unique safety feature, the safety lock, ensures that the machine will not start until it is completely locked. The device has three jars which carry out myriad food preparation functions, helping the cook prepare tasty food for the family in the least possible time. The food chopper jar is an attachment seen for the first time in a mixer grinder - this attachment chops vegetables and minces meat effortlessly. The liquidiser jar carries out all wet grinding jobs.

The spice grinder jar dry grinds all masalas, coffee, *dhal* and rice to a fine powder. The product is priced at Rs. 3595 and is backed by an extensive service network in twenty nine service centres across the country.

Enquiries; Braun, 34, Okhla Industrial Estate, New Delhi - 110 020. Phone : 91-11-6830218, 6830723, Fax: 91-11-6926296.

Britannia's Goody

More goodies are rolling out of Britannia. This time, it is in the traditionally dull packaged cake category. The company has launched Half/half, a soft cake filled with cream in two variants, chocolate - vanilla and vanilla - orange. half/half comes in a twin-cake pack and a tray pack containing five cakes. Britannia is hoping that the product will appeal to youth as a fun-time all time snack. Currently available only in Delhi. Half/half is expected to be launched across the country soon.

After making its entry into the dairy sector last year, Britannia is extending its portfolio with a butter alternative, or what it calls the "richer, creamier and tastier butter". Company cources claim that in the initial round of consumer testing, the Britannia butter outscored the competition on all parameters. Over to the consumer to decide which is the better butter.

Domestic Water Softener

Hard water usage for domestic purpose has many hazards. Bathing in hard water affects your skin and causes rapid hair fall. Hardwater decreases life and efficiency of appliances by 45 percent and increases their maintenance cost by 25 percent. Cooking gas consumption increase by 30 per cent and life of fabrics is reduced by 15 per cent. The World Health Organisation (WHO) has specified the maximum permissible limit of hardness in water as 50 mg/litre (ppm). About 62 per cent of India suffers from hard water supply with a hardness level of more than 100 ppm.

Softenizer from Ion Exchange (India) is a modern and efficient water conditioning system which removes hardness from water by passing it through resin media. Salt is used to revitalise the system periodically to provide soft water for daily needs. It is the most cost effective option to save money on maintenance cost and power consumption, increase life and efficiency of expensive appliances and reduce consumption of costly soaps, shampoos and detergents. It reduce hardness from water keeping it within the permissible limits specified by the WHO. It has a timer valve which does not require electricity and automatically operates all functions of the unit. Its dimensions are 1120-310-425 (H-D-W), net weight is 26 kg and it has a water pressure range of 1.5 to 9 kg/sq.cm. It is priced at Rs. 18,000. Higher capacity models are also available. Enquiries; Ion Exchange (India) ltd., 10 Bengal Chemical Compound, 502, Veer Savarkar Marg, Prabhadevi, Mumbai-400 025.

Three-in-One Washing Machine

A Three-in-One Washing Machine, which can wash fruits and vegetables, dishes, and clothes has been patented by Prof. R. V. Reddy of Mumbai.

The Washing Machine has a stainless steel grill, an acessory which can be fitted into a traditional washing machine (but with steel tub only). The adjustable grill serves as a base on which to place fruits or vegetables, or dishes as the case may be.

Fruits can be washed by putting them in perforated cottom bags, placed on the grill. Enquiries : Prof. R. V. Reddy, 153/5151, Nehru Nagar, kurla (E), Mumbai - 400 024. Phone: 5226942.

RESEARCH ROUND-UP

IARI Develops Early Maturing Maize

The country's first early maturing maize hybrid that can be bred quickly has been developed by crop scientists at the Indian Agricultural Research Institute (IARI). The breakthrough will improve India's maize production considerably.

Compared to the current maize hybrids that mature in 100-120 days, two new maize varieties developed mature in just 70-80 days.

This early-maturing trait is useful to regions with either scanty or excess rainfall, where farmers can grow a quick maize crop in between the main cropping seasons according to V. P. Ahuja. Senior scientist at IARI's maize directorate.

A second advantage with the two varieties developed by Ahuja and colleague B. K. Mukherjee is that they are produced from "single crosses" - each variety is produced from a cross between two selected parent plants.

Current Indian maize hybrids are produced from "double crosses", a longer process that involves four parent strains.

The new IARI varieties are especially suited for Rajasthan, Madhya Pradesh, Orissa and parts of Maharashtra, which have adequate water for limited period and need a variety that matures quickly before the dry period sets in.

They are also suited for areas such as Bihar and Uttar Pradesh that need to harvest the maize crop quickly before the onset of floods in the first week of September.

They would also fit in the intensive cropping system of the indo-Gangetic plains, where the short-duration hybrids will give an additional crop in between the main cropping patterns.

Early maturing hybrids are potentially useful for cultivation in 2.5-3.0 million hectares in the country that constitute 40-50 per cent of the total maize growing area. The yields of the two new single-cross early-maturing hybrids-'Pusa early hybrid Makka 1' and 'Pusa early hybrid Makka 2'- was double that are current varieties.

New Technology to Keep Fish Fresh

Marine exporters in the country who have been facing serious problems in preserving wet fish for more than three days can now overcome those problems.

Ganesh Benzoplast, a Mumbai-based manufacturer of food preservatives, has developed a process that helps preserve fish for longer duration.

By adding its product, Preserfish, to water before it is converted into ice for being used in preservation of fish, cuts down and even kills the bacterial population, and thus helps in keeping the fish intact for nearly 15 days, according to a press release issued by the company.

It said that mere using of ice would at best retards the growth of bacteria for three to four days but not help reduce the bacterial load attacking fresh fish. The new product mixed with ice, however, would destroy harmful organisms such as *E.coli* and *Salmonella* in sea foods, if used in prescribed quantities. The company claimed that the product has been tested in various reputed government and private laboratories and its efficacy has also been proved. Preserfish is produced from a variety of non-toxic food additives that are widely used the world over for preserving pharmaceutical and food products.

Vitamin B_2 Can Prevent Migraine

A daily dose of Vitamin B_2 or Riboflavin can prevent migraine attacks, according to a study published in Neurology, the Journal of the Academy of American Neurologists. Victims of severe migraines often suffer from day-long headaches accompanied by nausea, sickness and sensitivity to light and noise. A team of Belgian scientists led by Jean Schoenen of the University of Liege prescribed the 55 participants in their study, 400 milligrams of vitamin B_2 per day, which is a very high dose. The patients suffered 37 per cent fewer migraines than those in a comparable group, who were not given the vitamin.

More Chips with Less Oil from New Potatoe Varieties

Here's good news for those fond of potatoes, but worried about their calories- two new potato varieties developed by scientists at the Central Potato Research Institute, a laboratory under the Indian Council of Agricultural Research (ICAR), can give more chips and French fries but consume less oil on frying. The varieties, Kufri Chipsona 1, and Kufri Chipsona 2 , have been developed by a team led by P. C. Gaur, Head of the division of genetics and plant breeding.

They produce white chips comparable to international standards. The varieties possess high tuber dry matter in the range of 22-24 per cent, but low reducing sugars-about 100 mg per 100 grams fresh weight. They are also resistant to the late blight disease. Unlike chipping varieties of Europe and U.S.A., which mature in 150-160 days, 'Kufri' Chipsona 1, and 'Kufri' Chipsona 2, mature in 100-110 days. The tubers of these varieties can be harvested at any time after 90 days and used for making chips.

High Productivity Pepper Thresher Evolved

A power-operated thresher which can thresh pepper ten times more than manual threshing has been evolved in one of the plantation estates in Gudalur in Tamil Nadu's Nilgiri district. " The pepper thresher has beer fabricated locally by trial and error and has been in use for the last 15 years," an article in Spices Board journal Spice India says. Pepper, grown as intercrop in coffee, cardamom, arecanut and other plantation crops, is threshed manually by workers who trample on the spike containing the berries. Removal of these berries is a labour-intensive operation and requires high cost for harvesting and threshing.

As pepper harvest coincides with that of coffee, scarcity of labour exists for harvest of both the cash crops. The Spices Board has evaluated the performance of the thresher in collaboration with the Tamil Nadu Agricultural University in Coimbatore. The evaluation has shown the thresher in a positive light. "If spikes are threshed on the same day of harvest, six to seven quintals of pepper could be threshed per hour as per the evaluation," the article says.

Keeping Food Fresh by 'Electrocuting' Microbes

A new food preservation technology without the use of radiation has been developed by British scientists. The process uses electrically-charged air particles to kill the microbes responsible for food decay and obviates the use of preservatives.

Within creasing public demand for high quality food at reasonable prices, the technology finds a way to keep perishables fresh and in peak condition as long as possible from farm to the supermarket shelf without affecting their flavour, nutritional value or safety.

Tests on slices of chicken artifically contaminated with *Salmonella* food poisoning bacteria, proved the high efficiency of the technique and its capacity to reduce appreciably the risk of food poisoning.

The process lengthens the shelf-life of food and leave its taste and texture unaltered. Potential applications extend from cooked and un-cooked meat to fish, vegetables, fruits and even spices. Some types of food packaging can also be sterilized by the process.

The 'ions of air molecules' that immerse the object requiring sterilizing are formed by a high voltage generator and are discharged from a conductor maintained at a high electric potential with respect to earth.

Negative ions formed at the point are repelled by the negative potential at that point and create an 'ion wind' that is attracted towards bodies with a relative positive potential and conversely in the case of positive ion.

The destruction of gram-negative and gram-positive bacteria, yeast and moulds is dose-dependent and is affected by several parameters including exposure to time, distance from the ion source, charge of ions that can be changed by reversing the polarity of the electrodes, and the number of ions per unit area making impact on the surface to be treated.

Eat Carrot to Prevent Cancer

Cancer cell division is blocked by a chemical in carrot, biologists say. A common chemical derivative of vegetables has been used by researchers, studying leukemia to block the uncontrolled cell division that leads to cancer.

The chemical is retionic acid, a product of vitamin A, which the body manufactures from carotenes, the compounds found in a wide assortment of yellow-orange vegetables and fruits, from carrots and sweet potatoes to pumpkins and apricots.

Retinoic acid reverses the growth-promoting effects of oncogenes, the mutated genetic material that induces cancer. The new finding, which to date has been restricted to the test-tube level, could lead to enhanced therapies for those cancers, including leukemia, that seem to respond to retinoic acid. The research also highlights the cancer-prevention role of carotenes.

Retionic acid is a metabolic product of retinol, the active form of vitamin A. The compound had been shown by other researchers to regulate normal cell growth and differentiation. The latest results - using transforming proteins to switch on proto-oncogenes, the precursors to oncogenes, demonstrate how retinoic acid can use the same chemical-signalling cascades that cause cell growth instead to arrest growth. Retinoic acid can reverse the defect in growth control that was caused by the viral agent and result in cell-growth arrest. Now, the researchers need a deeper understanding of how retinoic acid causes these changes - and exactly which molecules are affected by retinoic acid.

Ongoing studies along these lines aim to explain exactly how retinoic acid works on oncogenes and whether other related compounds would be more effective in chemotherapy. As a result, oncologists might be able to fine-tune the chemotherapy cocktails given not only to leukemia patients but also to patients with other types of cancer.

Turmeric in Fight Against Cancer

Turmeric, known for its therapeutic properties besides its use in sub-continental cooking, could even be a cancer-buster.

The latest development in the turmeric saga is a study done by Bandaru Reddy, an Indian American scientist at the American Health Foundation in Valhalla, New York, finds curcumin - a compound found in turmeric - seems to have cancer-fighting properties.

Reddy presented his results at the annual meeting of the American Association for Cancer Research in New Orleans.

Although human studies are yet to be done, the compound inhibited cancer growth in 60 per cent of colon tumours induced in laboratory rats by cancer-causing agents.

In rats given curcumin before introduction of the cancer-causing agents, the incidence of cancer was reduced by about 30 per cent.

Reddy studied curcumin because, like aspirin, it is known to have anti-inflammatory properties and acts like an antioxidant. Currcumin might be responsible for the low colon cancer rate in India, but it is too early to say for sure.

Edible Oil from Teaseeds

South Indian tea seeds have great potential for possible use as a source of supplementary protein and edible oil for human consumption. Preliminary studies carried out by Upasi Tea Research Institute at Valparai have shown that south Indian tea seeds could also be used for animal and other industrial applications.

According to R. Ravichandran and R. Parthiban of the Institute, the study revealed that tea seed flour can be used in animal and human nutrition. Saponians, constituting 11 per cent of the kernel, are valuable by-product of tea seeds, which are plant glycosides with good emulsifying properties and exhibited anti-oxidative and anti-inflammatory properties and toxic in certain cases.

The contents of carbohydrates ranged from 18 to 20 per cent in seed kernel and 10 per cent in hull, they said in a paper in the recent issue of Planters' Chronicle. The ash content of the kernel (4 to 5%) and that of hull (1 to 2%) agreed with the reported figures. The crude fibre content was 7 to 10% in the kernel and 70 to 75 per cent in the hull.

The hull contained about 40 per cent furfural, which has got high industrial application and kernels yielded oil in the range of 30 to 32 per cent and were clear, free flowing and with acceptable organoleptic properties, the paper said.

DATA BANK

World Tea Crop

All Figures in million kg

Country	Upto	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
India North	Feb.	2.7	4.0	3.6	3.2	3.5	4.8	2.3	5.3	5.4	6.5
India South	Feb.	15.4	19.7	26.0	20.7	19.0	28.4	20.8	21.2	24.7	30.5
Bangladesh	Dec.	38.4	45.1	43.9	48.3	51.4	52.0	47.0	55.1	51.5	0.0
Sri Lanka	Feb.	26.4	35.3	34.8	29.6	33.1	36.8	40.7	40.1	38.0	43.5
Kenya	Feb.	30.7	37.9	37.5	32.4	40.8	27.7	40.2	46.9	37.9	58.0
Uganda	Dec.	4.7	6.6	8.8	9.4	11.2	13.8	12.7	16.5	21.1	0.0
Tanzania	June.	8.8	10.9	11.2	11.2	12.8	12.7	14.3	11.6	11.8	0.0
Malawi	Feb.	11.7	12.9	11.9	11.2	9.8	12.3	10.8	11.4	11.7	13.4
Zimbabwe	Sept.	12.6	12.2	11.5	6.4	9.7	10.1	0.0	12.0	11.4	0.0
Indonesia	Sept.	75.6	87.0	79.9	78.5	71.9	73.1	0.0	90.8	75.9	0.0

Production of Wheat in India

Year	Quantity *(million tonnes)*
1991-92	55.7
1992-93	57.2
1993-94	59.8
1994-95	65.8
1995-96	62.6
1996-97	68.9
1997-98	68.5

DATA BANK

World Cereals Production

Year	Quantity *(Incl. Paddy in million tonnes)*
1990-91	1950
1991-92	1890
1992-93	1960
1993-94	1900
1994-95	1955
1995-96 (Estimate)	1910
1996-97 (Estimate)	2060
1997-98 (Forecast)	2075

Exports of Soy from India

Month	1996-97	1997-98
	(Quantity '000 tonnes)	
April	2,77,326	1,58,558
May	2,34,891	1,03,360
June	1,09,590	31,631
July	1,16,213	57,462
August	73,642	32,174
September	47,230	53,178
October	19,394	89,695
November	1,75,432	2,20,441
Total	**1,053,718**	**7,46,499**

Exports of Turmeric from India

Month	Quantity *(tonnes)*	Value *(Rs. in crores)*
1991-92	19,661	37.76
1992-93	19,726	48.85
1993-94	25,436	52.56
1994-95	28,286	45.17
1995-96	26,675	44.23
1996-97	21.600	54.71
1997-98 (Estimated)	27,000	67.50

TRADE FAIRS & GET-TOGETHERS

Anuga Spezial

The Forum for Regional Specialities, October 15-18, 1998

For the first time, Anuga Spezial will be held as the Forum for Regional Specialities from 15th to 18th October 1998 in Cologne, Germany. It will provide understanding opportunities to contact visitors from the retail and catering trades as well as end-consumers. The German Agricultural Society (DLG) welcomes this new facility for the food business and is thus supporting Anuga Spezial by assuring the conceptual sponsorship. At anuga spezial, the DLG will be represented with its own stand and will provide all those interested with the information they require.

Contact Address : Messe-Und Ansstellungs - Ges.m.b.H.Koln, Messeplatz 1, D-50679 Koln. Postfach 210760, D - 50532 Koln. Telephone 0221/821-0, Fax : 0221/ 821 - 2574; E-mail : As@koelnmesse.de;

Internet:www.koelnmesse.de/anuga spezial.

Inter Mopro - '98
Germany

September 6th - 9th 1998 at Dusseldorf.

Inter Mopro '98 - The world's leading biennial trade event for dairy industry and products will opens its door to the dairy industry at Dusseldorf in Germany from September 6th-9th-1998.

The exhibition programme for Inter Mopro '98 include milk and milk-based products, cream and cream products, cheese, butter, desserts, dairy equipment and equipments for sales and distribution.

Inter Mopro ' 98 with its vast array of exhibits promises an ultimate global marketing opportunity on a single platform for Indian professionals, engineers, technologists, scientists, academicians, administrators, entrepreneurs and representatives of the different facets of Indian dairy industry and can make India a strong base for a new generation of dairy-based products combining Western dairy know-how with traditional Indian ingredients through a visit to Dusseldorf, Germany.

During the last two decades, the Indian dairy industry has seen a host of new entrants - small, big, Indians, NRIs and MNCs. There are more encouraging foreign dairy companies, who are interested in investing heavily in the country to compensate for the lack of growth in saturated western markets.

For further details contact : The Indo-German Chamber of Commerce, Maker Tower, 'E', 1st Floor, Cuffe Parade, Mumbai - 400 005 or ORBIT - 1127, Midway Premises, A. S. Marathe Marg, Opp. Lucas - TVS, Prabhadevi, Mumbai - 400 025;

Phone : 4379282/3, 4305733; Fax : 22-4305707, 4314153;

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BOOKS

Handbook on Traditional Milk Products

The publishers of Dairy India have announced plans to publish a comprehensive handbook on Indian milk products. It will focus on emerging technologies that are transforming the art of making traditional milk products. The new database provided in the proposed publication would help dairy scientists, engineers and technocrats to popularise the emerging know-how amongst enterpreneurs, adding a new dimension to India's growing organized dairy sector and enhance its viability.

This first-of-its-kind technical reference handbook on traditional milk products aims to appraise various trends that have taken place to modernise this age-old traditional sector of *mithais* and other related products. It would also explore marketing opportunities, new technologies, investment prospects that this dynamic sector offers today in abundance. Further, innovations made in the development of indigenous products, processes, equipment and packaging would be documented.

The popularity of milk-based *mithais* and other delicacies is legendary in the country since time immemorial. Till recently, its production was in the hands of the *halwai*. In the last two decades, steps have been taken to modernise this traditional sector to transform the personalised art into a proven technology. This publication would help meet the growing demand for the Indian sweets in distant lands of America, Europe, Middle-East and Africa.

One impediment, however, in transforming the increasing worldwide interest is the absence of an authentic technical reference handbook on Indian milk products. to fill this gap, the publishers of Dairy India requested leading authorities on the subject to help in the compilation of such a compendium.

A volume of about 500 pages, this sourcebook is scheduled for publication later this year. The publishers have invited suggestions for authentic data, recipes and other significant aspects of traditional milk products for inclusion in the proposed handbook. Further, leading makers and manufacturers of *mithais* and indigenous milk products would also have an opportunity to participate in the forthcoming compendium by getting their company profile published in its specially created section, "Who's Who". Details can be had from : The Editor, *Indian Milk Products*, c/o Dairy India, A-25, Priyadarshini Vihar, Delhi - 110092; Phone (91-11) 2243326, 2243039, Telefax : (91-11) 2243039, E-mail: yearbook@nda.vsnl.net.in.

Food and Drink - Good Manufacturing Practice

A Guide to its Responsible Management

The Institute of Food Science and Technology will launch the 4th Edition of its best selling **Guide to Good Manufacturing Practice** on 7th September 1998.

Said Ralph Blanchfield, Editor and Chairman of the group which produced the 4th edition, "For over a decade, the IFST GMP Guide has been the comprehensive "bible" setting out the means to ensure that the manufacturing process delivers a food and drink product that is uniform in quality, free from defects and contamination and as safe as it is humanly possible to make it.

"The last edition, published in 1991, has served its purpose well and has continued to receive international acclaim. The basic principles of GMP do not change, but science and technology develop and the context in which GMP principles are applied does change."

The 4th edition of the Guide has been considerably revised and extended, to take account of important developments in both science and UK and EU legislation. The material on HACCP has been greatly expanded and enhanced. Two new chapters highlight the increasing interest in novel foods and processes and increased recognition of food allergens as an important food safety issue.

The new 4th Edition will be of a valuable reference for those in food education and training and in food safety and enforcement within the remit of the new Food Standards Agency.

The normal price of the Guide will be £ 55.00. However, threre will be a special pre-publication discount 5 per copy on paid up orders received **before 1st September 1998.**

Copies can be ordered from IFST by sending a cheque, payable to IFST, to the Team Administrator, IFST, 5 Cambridge Court, 210 Shepherd's Bush Road, London W6 7NJ. Tel: 0171 603 6316; Fax: 0171 602 9936; E-mail: ifst@easynet.co.uk.

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